Project Manual

Sedgwick County... working for you

Sedgwick County Work Release Center Parking Lot, ADA and Master Control Upgrade Wichita, Kansas

March 7, 2016

Mead & Hunt No. 4311900.155639.01

Mead & Hunt
10700 West Research Drive, Suite 155
Wauwatosa, Wisconsin 53226
262-790-0232
meadhunt.com

SECTION 00 01 01
PROJECT TITLE PAGE

PROJECT:
SEDGWICK COUNTY WORK RELEASE CENTER
PARKING LOT, ADA AND MASTER CONTROL UPGRADE
701 W. Harry
Wichita, KS 67213

OWNER:
SEDGWICK COUNTY PROJECT SERVICES
525 N. Main Street
Wichita, KS 67203

ENGINEER:
MEAD & HUNT
10700 West Research Drive, Suite 155
Wauwatosa, WI 53226

Phone: (262)790-0232

ARCHITECT:
MASTER
CONTROL
UPGRADE
HMN ARCHITECTS
7400 W. 110th Street, Suite 200
Overland Park, KS 66210

Phone: (913)451-9075
FAX: (913)451-9080

ARCHITECT:
PARKING
ADA CELL
UPGRADE
HANNEY & ASSOCIATES ARCHITECTS
1726 South Hillside
Wichita, KS 67211

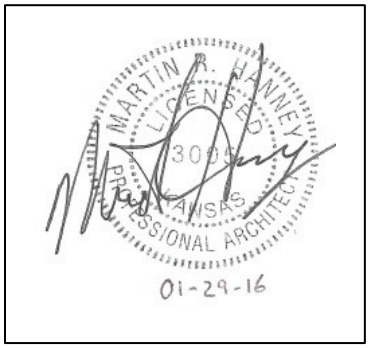
Phone: (316)683-8965
FAX: (316)684-1441

* * *

SECTION 00 01 07
SEALS PAGE

ARCHITECTURAL – PARKING LOT REPAIR

The documents intended to be authenticated by my seal are limited to:



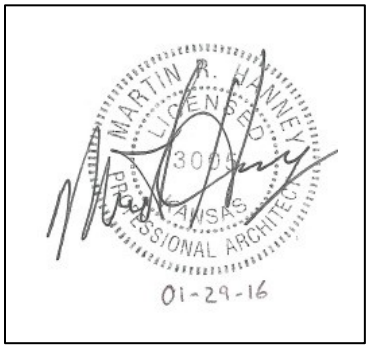
Drawing Sheets: C011, C012

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Martin Hanney, Hanney & Associates Architects

ARCHITECTURAL – ADA UPGRADES

The documents intended to be authenticated by my seal are limited to:



Specifications: 033000, 041000, 042000, 099000, 108000

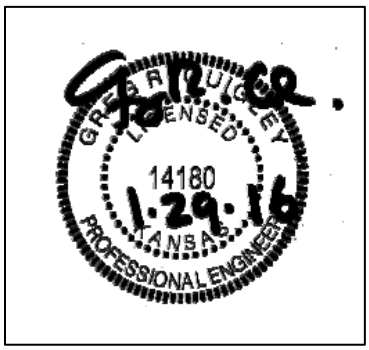
Drawing Sheets: A011

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Martin Hanney, Hanney & Associates Architects

MECHANICAL – ADA UPGRADES

The documents intended to be authenticated by my seal are limited to:



Specifications: 220517, 220518, 220523, 220529, 220553, 220719, 221116, 221119, 221316, 221319, 224213.13, 224216.13, 224223, 224716, 230713, 233113, 233300, 233423, 237113

Drawing Sheet: M101

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Greg Hummingbird, Basis Consulting Engineers

ARCHITECTURAL – MASTER CONTROL UPGRADE

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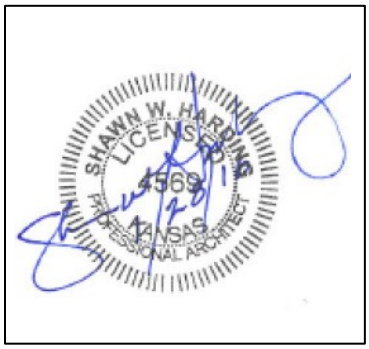


Specifications: 024119, 064116, 079200, 081113, 087100, 096519, 096813, 123661

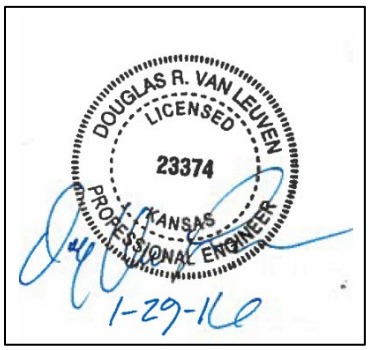
Drawing Sheets: AD100, A101

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Shawn Harding, HMN Architects, Inc.

MECHANICAL – MASTER CONTROL UPGRADE

The documents intended to be authenticated by my seal are limited to:



Specifications: 230500, 230513, 230529, 230593, 230700, 230923, 230993, 232113, 232300, 238126

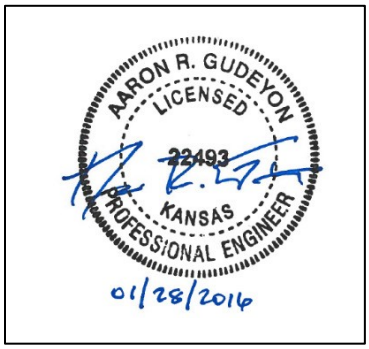
Drawing Sheets: M001, M201

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Douglas Van Leuven, Mead & Hunt

SECURITY – MASTER CONTROL UPGRADE

The documents intended to be authenticated by my seal are limited to:



Specifications: 079210, 111900, 111910, 111920, 112000, 280510, 280520, 280600, 284600, 284610, 284620, 284630, 284640, 284650, 284660

Drawing Sheets: DE001, DE101, SE001, SE011, SE101, SE201, SE301, SE401, SE501

I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the project.

By: Aaron Gudeyon, Mead & Hunt

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SECTION 00 01 15
LIST OF DRAWING SHEETS

The following List of Drawings bound separately from the Project Manual comprise the Drawings as referenced in the Bidding Documents and the Contract Documents.

The arrangement, numbering, titling and location of the Drawings within a bound set shall not control the Contractor in dividing the work among Subcontractors or in establishing the extent of Work to be performed by any trade.

DRAWING NO.	**DRAWING TITLE**
GENERAL	
T1	Title Sheet
PARKING LOT UPGRADE	
C011	Site Plan
C012	Enlarged Paving Plan
ADA UPGRADE	
A011	Details
M101	Mechanical – Ground Floor
MASTER CONTROL UPGRADE	
AD100	Ground Floor Demolition
A101	Ground Floor
DE001	Detention Equipment – General Notes
DE101	Detention Equipment – Ground Floor
M001	Mechanical – General Notes
M201	Mechanical – Enlarged Plans
SE001	Security Electronics – General Notes
SE011	Security Electronics – Site Plan
SE101	Security Electronics – Ground Floor
SE201	Security Electronics – Enlarged Plans
SE301	Security Electronics - Details
SE401	Security Electronics – Riser Diagrams
SE501	Security Electronics – Wiring Diagrams

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SECTION 00 11 16
INVITATION TO BID

PROJECT: Sedgwick County Work Release Center
Parking Lot, ADA and Master Control Upgrade
701 W. Harry
Wichita, KS 67213

COUNTY BID NUMBER: 16-0031

PRE-BID MEETING:
Will be held on site at 701 W. Harry, beginning at **1:30 p.m**. **CDT on March 15, 2016.**
Participants will meet in the **Public Lobby** on ground floor of the Work Release Center.

Attendance is not mandatory; however, this will be the only time to meet directly with County staff and the Architect to answer questions concerning this project. General contractors are encouraged to have their subcontractors attend this meeting to view the site conditions

Bidders are encouraged to examine bidding document as early as possible. **In order to ensure each bidder has the most current information for bidding there is an established date and time for last questions to be asked. Bidders requiring clarification or interpretation of the Bidding Documents shall make such requests, in writing only, to Kim Evans, Purchasing Agent, at** Kimberly.J.Evans@sedgwick.gov **no later than 5:00 p.m. CDT on March 22, 2016.**

RESPONSES TO INVITATION FOR BID:
Will be received in the Sedgwick County Purchasing Department, located at Finance Department, Main Courthouse, 525 N. Main Street, Suite 823, Wichita, Kansas, until **1:45 p.m. CDT on April 5, 2016**. Late Bids will not be accepted and will not be considered for award recommendation.

BID RESPONSES WILL BE OPENED AT: 2:00 p.m. CDT on April 5, 2016.
This meeting will be held in the Finance Department, Main Courthouse, 525 N. Main, Suite 823, Wichita, Kansas. All interested parties are invited to attend this meeting, as bids/responses will be received, publicly opened and read aloud.

After review and appropriate approval, a Contract will be awarded to the lowest responsive, responsible and best bidder meeting specifications and appropriately licensed to do specific work outlined in these documents.

Plans and specifications are available in electronic form only and may be downloaded at no cost from www.sedgwickcounty.org. Company information will be collected to generate a plan holder's list which will be updated weekly and available at the Sedgwick County Work Release Center – Parking Lot, ADA and Master Control Upgrade section of the current RFP/RFQ page at www.sedgwickcounty.org.

A RECOMMENDATION FOR CONTRACT AWARD:
will be made to the Board of Bids and Contracts at its regular meeting **Day, 10:00 a.m. CDT on April 7, 2016,** generally held in the County Commission Meeting Room located at 525 North Main, third floor, Wichita, Kansas, although this date or location could change.

CONTRACT AWARD:
Board of County Commissioners will consider award on **Day, 9:00 a.m. CDT on April 13, 2016, although this date could change.**

PROJECT SCOPE:
The Scope of this project shall include all related work required to upgrade the existing parking lot, upgrade the holding cells in intake per ADA requirements and upgrade and replace the PLC's for the locking control system, door control boards and relays, intercom head-end software. Provide new access control system. Upgrade and replace the existing analog video surveillance equipment to an Internet Protocol (IP) video surveillance system. Upgrade and replace existing analog intercom system to a new digital intercom system. A new fiber optic PLC Ethernet network and IP video Ethernet network will be installed to support the upgrades for the security electronic systems.

BIDDING DOCUMENTS:

1. Complete sets of Bidding Documents shall be used in preparing Bids.
2. Neither the Owner nor the Architect/Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
3. The Owner or Architect/Engineer, in making copies of the Bidding Documents available, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.
4. Bids shall include furnishing all labor, materials, equipment and performing the Work for the above-described Project in strict accordance with the Bidding Documents and any Addenda.

DURING BIDDING PERIOD:
Inquiries regarding Bid Documents, Bid/Selection process or any requests for information about this specific project shall be directed in writing only to:
Kim Evans, Purchasing Agent
525 North Main, Suite 823
Wichita, KS 67203
Telephone: (316) 660-7150 Fax: (316) 383-7055
E-mail: Kimberly.J.Evans@sedgwick.gov

OWNER'S REPRESENTATION:

Owner's Representative for the duration of the Project:

Tania E. Cole, Project Services Program Manager
Historic Courthouse
525 N. Main, Suite 315
Wichita, Kansas 67203
Telephone: (316) 660-9865 Fax: (316) 383-7696
E-mail: Tania.Cole@sedgwick.gov

Architect's Representative – Parking Lot and ADA Upgrade

Martin Hanney
Hanney & Associates Architects
1726 South Hillside
Wichita, KS 67211
Telephone: (316)683-8965 Fax: (316)684-1441

Architect's Representative – Master Control Upgrade

Adam Kuehl
HMN Architects
7400 W. 110th Street, Suite 200
Overland Park, KS 66210
Telephone: (913) 451-9075 Fax: (913) 451-9080

Engineer's Representative – Master Control Upgrade:

Jeff Pronschinske
Mead & Hunt
10700 W. Research Drive, Suite 155
Wauwatosa, WI 53226
Telephone: (262) 790-0232
E-mail: jeff.pronschinske@meadhunt.com

BIDDER'S REPRESENTATION:

In order to induce the Owner to accept their Bid, in addition to and not in lieu of any other representations and warranties contained in the Bidding Documents, the Bidder represents and warrants the following to the Owner:

1. The Bidder and their subcontractors are financially solvent and possess sufficient working capital to complete the Work, and perform all obligations hereunder.
2. The Bidder is able to provide the plant, tools, materials, supplies, equipment, and labor required to complete the Work and perform the Bidder's obligations hereunder.
3. The Bidder will be authorized to do business in the State of Kansas, and will be properly licensed to do this work.
4. The Bid and execution of the Bidding Documents and the Bidder's performance thereunder are within the Bidder's duly authorized powers.
5. The Bidder has made an exhaustive study of the Bidding Documents; understands the terms and provisions thereof; and has sought or will timely seek any and all necessary clarifications prior to submitting the Bid; and that the Bid is made in accordance with the foregoing.
6. The Bidder has visited the Project and is completely familiar with the local and special conditions under which the Work is to be performed and has correlated such knowledge with the requirements of the Bidding Documents.
7. The Bid is based upon the approved materials, systems and equipment described in the Bidding Documents without exception, including all warranties, coordination and components required to perform the Work.
8. The Bidder certifies that their Bid is submitted without collusion, fraud, or misrepresentation as to other Bidders, so that all Bids for the Project result from a free, open and competitive bidding environment.
9. The Bidder possesses a high level of experience and expertise in the business administration, management, and superintendence of projects of the size, complexity and nature of this particular Project, and that the Bidder will work with care, skill and diligence of such a contractor.
10. The Bidder acknowledges that the Owner is relying upon this Bidder's skill and experience in connection with the Work being bid herein.
11. That complete sets of Bidding Documents were used in the preparation of the Bid and that neither the Owner nor the Architect is responsible for errors or misinterpretations resulting from the use of incomplete sets of such Documents.

The foregoing warranties are in addition to, and not in lieu of (A) any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance of the Work and (B) any and all other warranties, representations and certifications made in the Bidding Documents. The Contractor's liability hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth herein and in the Contract Documents shall survive the final completion of the Work or the earlier termination of this Agreement.

Bid Guarantee:

1. Bid Security is required in the amount of a least 5% of the Bid plus all additional Alternates. In case of multiple prices in a Bid or Alternate, write for the maximum possible Contract amount.
2. Bid Security can be in the form of a certified or Cashier's Check or Bid Bond acceptable to Sedgwick County. Checks are to be made payable to the Sedgwick County Clerk and drawn on a solvent Kansas bank or trust company. These checks or bonds will be retained by Sedgwick County until the purchase contract has been awarded.
3. Bid Bonds shall be written by a bonding agency approved by the United States Treasury Department and licensed to do business in the State of Kansas.
4. Bid Bonds shall be submitted on AIA Document A310, latest edition, as issued and approved by the American Institute of Architects.
5. Bid Security will be retained by the Sedgwick County Clerk until the Contract for the Project has been completed and is a guarantee that if awarded the Contract, the Bidder will enter into a Contract and give bonds as required. In the event the successful Bidder fails to consummate a signed Contract, through no fault of the Owner, Bid Security shall be retained by the Owner as liquidated damages and not as a penalty.
6. Sedgwick County reserves the right to retain the Bid Security of the three (3) lowest Bidders until the successful Bidder has entered into a Contract or until 60 days after Bid opening, whichever is the shorter. All other Bid Securities will be returned as soon as practicable.

Sedgwick County is desirous of allowing as many Kansas vendors as possible the opportunity to participate, including minority owned, woman owned and small businesses, in the roles of general contractors and subcontractors. If your company does not fall into either of these categories, your efforts to contract with vendors who fall in these categories are appreciated.

General Contractors will be required to maintain a subcontractor worksheet throughout the project and will submit the worksheet to County staff at anytime requested but shall submit the worksheet at the completion of project.

END OF SECTION

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

PROJECT: Sedgwick County Work Release Center
Parking Lot, ADA and Master Control Upgrade
701 W. Harry
Wichita, KS 67213

COUNTY BID NUMBER: 16-0031

ARCHITECT: Martin Hanney & Associates Architects
PARKING LOT 1726 South Hillside
& ADA CELLS Wichita, KS 67211
Telephone: (316) 683-8965 Fax: (316) 684-1441

ARCHITECT: HMN Architects
MASTER 7400 W. 110th Street, Suite 200
CONTROL Overland Park, KS 66210
Telephone: (913) 451-9075 Fax: (913) 451-9080

ENGINEER: Jeff Pronschinske
Mead & Hunt
10700 W. Research Drive, Suite 155
Wauwatosa, WI 53226
Telephone: (262) 790-0232

Bids shall be made in accordance with these Instructions to Bidders:

A. Responses to this invitation will be accepted only from General Contractors who are licensed to do business in Sedgwick County.

B. Applications will also be accepted from General Contractors who have applied to receive a reciprocal license.

C. A copy of General Contractor's Certificate of Insurance will be required to be submitted with the Bid at the time the bids are due. Insurance policy will be due from the successful contractor as part of the required documents prior to issuance of the notice to proceed.

D. Bidding Documents shall include the Invitation for Bids, Bid Form, construction drawings, proposed Contract Documents, including any Addenda issued prior to receipt of Bids, supplemental information and any additional information requested.

E. Bids must be on a lump sum basis and shall be the Contract Amount.

F. Bidder Qualifications: Successful contractor shall establish an office in Sedgwick County, Kansas, and may be required by the Owner to furnish information to support the Bidder's capability to fulfill the Contract if awarded the Contract. Such information does not need to be submitted with the Bid, but may be requested at the Owner's option. Such information may include, but not be limited to, the following:

1. Proof of registration with the Kansas Director of Taxation by non-resident Bidders (K.S.A. 79-1009).
2. Proof of registration with the Kansas Secretary of State by foreign corporations.
3. List of projects of similar size and type the Bidder has constructed or in which the Bidder has been engaged in a responsible capacity.
4. Evidence the Bidder maintains a permanent place of business.

5. A current financial statement.

Examination:

1. BEFORE SUBMITTING A BID, each Bidder shall examine carefully all documents pertaining to the Work and visit the site to fully inform himself of the condition of the site and the conditions and limitations under which the Work is to be performed.

2. SUBMISSION OF A BID will be considered presumptive evidence that the Bidder has fully informed himself of the conditions of the site, requirements of the Contract Documents, and of pertinent national, state and local codes and ordinances, and that the Bid made allowances for all conditions, requirements and contingencies.

3. In reviewing these Documents, it is evident that certain information, if disclosed to the public, may jeopardize security of Sedgwick County, and appropriate measures will be taken to maintain confidentiality.

4. **In order to ensure each bidder has the most current information for bidding there is an established date and time for last questions to be asked. Bidders requiring clarification or interpretation of the Bidding Documents shall make such requests, in writing only, to the Purchasing Agent no later than 5:00 p.m. CDT on March 22, 2016.**

5. Samples shall be submitted by the above referenced deadline to permit evaluation and notification of Bidders.

6. Any interpretation, correction or change of the Bidding Documents will be made by written Addenda. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

Addenda:

1. DISCREPANCIES OR OMISSIONS in the documents will be clarified in the form of an electronic Addendum and will be posted on the County web site. Bidders finding discrepancies, omissions, or who are in doubt as to the meaning of any portion of the Contract Documents, should immediately request an interpretation from the Senior Purchasing Agent. In response, an Addendum will be issued and the contractor shall rely solely on information contained in the written Addenda about said discrepancy or omission. **Neither the Architect nor the Owner will be responsible for any other form of instructions or interpretations given to the contractor, either verbal or written.**

2. ADDENDA received by Bidders shall be acknowledged by same on their Bid Form.

Substitutions:

1. Each Bidder represents that their Bid is based upon materials and equipment described in the Bidding Documents.

2. No substitution will be considered unless written request has been submitted to the Purchasing Agent and the Architect, in duplicate, for approval by **5:00 p.m. CDT on March 22, 2016**. Each such request shall include a complete description of the proposed substitute, drawings, cuts, performance or test data, or information necessary for a complete evaluation. If the Architect approves any proposed substitution, such approval will be set forth in Addendum.

Preparation of Bids:

1. BIDS shall be made on unaltered Bid Forms furnished by the County, or detached from this Project Manual.

2. FILL IN all blanks on the Bid Form with ink or type. Blanks left on Bid Form may be cause for disqualification of Bidder.

3. SIGN BID FORM in longhand, with name typed below signature. Where Bidder is a Corporation, Bids must be signed with the legal name of the Corporation, followed by the legal signature of an officer authorized to bind the Corporation to a contract.

4. RECAPITULATION of Work to be done shall not be included with any Bid.

5. Where so indicated by the makeup of the Bid Form, amounts shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.

Unit Pricing:

1. Contractor shall include the following unit costs in their bid:
   a. $ 253,200.00 – Base Bid
   b. $ 8,100.00 – Alternate No. 2
   c. $ 26,175.00 – Alternate No. 3

   Unit costs reflect the cost of the Div. 28 Security Electronics system as provided by Stanley Convergent Security Solutions – Noblesville, IN.

Identification and Submission of Bid:

1. Contractor shall provide one (1) Original of the Bid Response Form, Bid Security and other supplemental information required to be submitted with the Bid.

2. All of the Bid Documents shall be enclosed in a sealed envelope with the notation “Bid Enclosed” on the face. The firm name and address, Bid number, Bid opening date, and Bid opening time shall be provided in the lower left-hand corner of the Envelope.

Modification and Withdrawal of Bid:

1. A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period that a Bidder’s Bid Security is held following the time and date designated for the receipt of Bids. The Bidder so agrees in submitting his Bid.

2. WITHDRAWAL BEFORE BID OPENING: A Bid may be withdrawn at any time before Bid opening, but may not be resubmitted. If a bidder withdraws a bid, as authorized in K.S.A. 75-6905, the awarding authority may require that such bidder shall not be allowed to perform any work on the project through subcontract agreements or by any other means including re-bids.

3. AFTER BID OPENING: No Bid may be withdrawn or modified, except where the award of contract has been delayed for more than 60 days.

In the event of an Award, the lowest, responsive, responsible and best bid price meeting the Specifications will be required to enter into Contract required for the Project. Said Bidder shall also provide a Performance Bond for the full amount of the Contract. The Performance Bond, in the amount of 100% of the Contract amount, must be submitted within 30 calendar days after award of contract. Failure to return these Documents within the required time period may cause a cancellation of the Award.

Consideration of Bids/Selection Process:

1. Bids received will be opened and read aloud publicly.

2. Owner shall have the right to determine the acceptable Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

3. The Owner will award a Contract to the lowest, responsive, responsible and best Bidder provided that:

    a. The Bid conforms to and has been submitted according to the requirements of the Bidding Documents and includes the Certificate of Insurance including Contractor's General Automotive Liability, Workers Compensation Insurance and Owner's Liability Insurance.

    b. The Bid is judged to be reasonable.

    c. The Bid does not exceed the funds available.

    d. The Bid complies with the Instruction to Bidders and Mandatory Requirements.

    e. The completion time is satisfactory to the Owner.

    f. Evidence of the experience, qualifications and financial responsibility of the Bidder and his Subcontractors and the time of completion are all satisfactory to the Owner.

    g. The County reserves the right to reject Bidders in accordance with the Bidding Documents.

4. Bids will be screened by a Review Committee consisting of the Project Manager, Architect and the Purchasing Agent, Facilities Director and Sheriff's Department Representative.

5. No negotiations, decisions, or actions shall be initiated by any firm as a result of any verbal discussion with the Owner or employee of the Owner before the opening of responses to the document.

6. The Owner shall have the right to waive any informality and/or irregularity in any Bid received.

7. The Owner shall have the right to reject any and all Bids.

Time for Completion and Liquidated Damages:

All Bidders are required to state on the Bid Form the time needed for all Work under the general contract to be completed, which would yield their best Bid. Unless otherwise required, this time frame shall be stated in calendar days and shall represent the Contractor's commitment to complete the Project on schedule.

The contractual period will begin with the issuance of Notice to Proceed and continue through completion of the Project.

The Agreement will include a stipulation that liquidated damages will be assessed in the amount of $200.02 per calendar day after Completion Date that the Work is not Substantially Complete.

Upon satisfactory completion of the Contract, a formal CERTIFICATE OF PROJECT COMPLETION will be forwarded to the Contractor by the Project Architect. The date of substantial completion of the Project will be the starting date of the Warranty period.

All Work shall be in accordance with all Federal and State Laws, Local Ordinances and Building Codes, and the Americans with Disabilities Act of 1990.

Taxes: Materials and equipment incorporated in the Work are exempt from payment of sales tax under the laws of the State of Kansas.

Project Time Line:

The following dates are provided in addition to those previously stated to help interested contractors in planning participation in the Project herein. The dates listed, however, are in no way guaranteed and are subject to change without notice.

Project out for bid – March 7, 2016
Pre-bid Meeting – March 15, 2016 at 1:30 p.m. CDT
Final questions received – March 22, 2016 at 5:00 p.m. CDT
Final Addendum Issued – March 29, 2016 at 5:00 p.m. CDT
Bids Due in Purchasing – April 5, 2016 at 1:45 p.m. CDT
Bid Opening – April 5, 2016 at 2:00 p.m. CDT
Board of Bids and Contracts – April 7, 2016 at 10:00 a.m. CDT
Board of County Commissioners – April 13, 2016 at 9:00 a.m. CDT

Notice to Proceed:

No Work shall commence until the Owner issues a Notice To Proceed, and a Notice To Proceed will not be issued until all of the following are delivered to the Facility Project Services Office, Sedgwick County Courthouse, 525 N. Main Street, Suite 315, Wichita, Kansas 67203 by the selected vendor:

1. The Contract signed by the representative with authority and ability to do so.
2. Performance and Statutory Bonds with the attached powers of attorney. Attach the receipt of the Clerk of the District Court to the Statutory Bond.
3. List of subcontractors and supplier's proof of a valid Contractor's license from the jurisdiction in which the Work is being performed for both contractor and applicable sub-contractors is required.
4. Corporate Resolution of authority to sign and deliver the Contract Documents, executed by the Corporation's Secretary or Assistant Secretary and dated before all other dated submittals.
5. Domestic (Kansas) corporations shall furnish evidence of good standing in the form of a Certificate signed by the Kansas Secretary of State. Foreign (non-Kansas) corporations shall furnish evidence of authority to transact business in Kansas, in the form of a Certificate signed by the Kansas Secretary of State.
6. Construction Schedule with major milestones identified.
7. Insurance Certification for Payment.

Such documents must be delivered within 10 days of the Owner's written notification to the successful Bidder. If they are not delivered within such time then the Bidder will be deemed to have abandoned its contract with the Owner, and the Owner will award a contract to the next lowest and best Bid.

1. The successful Bidder shall not make claim either for time or money against the Owner for labor or materials performed or delivered prior to issuance of the Notice to Proceed.
2. The County's responsibility to issue a Notice To Proceed is expressly conditioned on the Contractor's timely execution and delivery of such documents.
3. The County intends to issue a Notice To Proceed within 30 days of receipt of Bids.

4. Bidders shall also note that the Work cannot begin until after a State of Kansas Sales Tax Exemption Certificate has been provided by Sedgwick County and affixed to the Purchase Order and the Notice to Proceed.
5. Contractor must submit Insurance Policy.

END OF SECTION

SECTION 00 41
00 BID FORM

BID PROVIDED BY:

_____ (Company Name)

I have received the Bid Documents, Specifications, and Construction Documents, collectively known as the Contract Documents for Construction of the

Sedgwick County Work Release Center
Parking Lot, ADA and Master Control
Upgrade

RFB 16-0031

as prepared by Engineer

In submitting this Bid, I agree:

1. To hold my Bid open for 60 days after the date of this Bid.

2. To enter into and execute a Contract, if awarded on the basis of this Bid, and to proceed in accordance with the requirements of the General Conditions and Contract Form.

3. To provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the Work in accordance with the proposed Contract Documents.

4. To remove and haul away from the construction site any and all debris arising from this contract and to assume sole liability for all removal, handling, and dumping of debris.

5. To comply with any and all local, state, federal or other governmental laws, rules and regulations with respect to the transportation, disposal, and dumping of debris and other excavated materials and Contractor shall secure any and all necessary permits and approvals incident to said transportation, dumping and disposal.

6. To further agree to indemnify and hold the Owner and Designer harmless from any and all claims and/or damage of any kind whatsoever as a result of the Contractor's performance of this Contract.

7. That attached to this Bid is one copy of the Certificate of Insurance including Contractor's General Automotive Liability, Workers Compensation Insurance and Owner's Liability Insurance.

8. **CALENDAR DAYS:**
   The Undersigned agrees to reach substantial completion of the Work in _____ consecutive calendar days from the date of Notice to Proceed.

   The Undersigned agrees to reach final completion of the Work in _____consecutive calendar days from the date of Substantial Completion.

   Total Calendar Days _____

9. **BID:**

BASE BID

To complete the Base Bid Work, in the time stipulated, in accordance with the Bidding Documents for the lump sum price of:

_____

_____Dollars ($_____).

ALTERNATE BID 1

Provide lump sum price to provide ADA holding cell improvements as shown.

_____

_____Dollars ($_____).

ALTERNATE BID 2

Provide lump sum price to provide detention door improvements as shown.

_____

_____Dollars ($_____).

ALTERNATE BID 3

Provide lump sum price to provide facility-wide paging system as shown.

_____

_____Dollars ($_____).

ALTERNATE BID 4

Provide lump sum price to provide floor improvements in Dormitories as shown.

_____

_____Dollars ($_____).

ALTERNATE BID 5

Provide lump sum price to provide floor improvements in Administration as shown.

_____

_____Dollars ($_____).

10. **ADDENDA:**
The Bidder acknowledges receipt of the following numbered Addenda:

None (__) #1 (_) #2 (_) #3 (_) #4 (_) #5 (_)

11. **AGREEMENTS:**
The Undersigned agrees to the following terms and conditions:

a. An incomplete Bid, or other information not requested which is written on this Bid Form, may be cause for rejection.
b. Read the Invitation for Bids and the Instructions to Bidders carefully.
c. The Owner reserves the right to reject any or all Bids and to waive all technicalities should such action be deemed to be in the best interest of the Owner.
d. This Bid may not be withdrawn for a period of 60 calendar days following the receipt and opening.
e. Failure to acknowledge receipt of any Addendum issued may be cause for a Bid rejection.
f. In the event that changes to the Work are required, the undersigned agrees that ten percent (**10 %**) total between General and Subcontractors of his net costs shall be added thereto for Overhead, Profit and General Requirements (including but not limited to, Insurance and Bonds).

12. **MAJOR SUBCONTRACTORS:**
The Undersigned acknowledges the following named major subcontractors are to be used for their respective division of work. Contractors shall identify by type, any disadvantaged, minority and women-owned businesses used as a subcontractor for this project.

Div. 11 - Detention Equipment Contractor:_____
Address – City, State, Zip:_____

Div. 26 – Electrical Contractor:_____
Address – City, State, Zip:_____

Additional, if necessary:

13. **DECLARATIONS:**
The Undersigned hereby declares he has carefully examined the Drawings and Specifications, has visited the actual location of the Work, has satisfied himself as to all conditions and understands that, in signing this Form of Bid, he waives all right to plead any misunderstandings regarding same and agrees to be bound by the provisions of said Drawings and Specifications and all statements made therein.

The Undersigned proposes to enter into Contract and to furnish and pay for the specified Bonds and other required Documents within 10 working days after notification of award of Contract.

14. **FIRM IDENTIFYING INFORMATION:**

FIRM NAME _____

CONTACT _____

SIGNATURE_____TITLE _____

PRINT NAME_____

ADDRESS_____CITY/STATE_____ZIP _____

PHONE_____FAX_____HOURS _____

TAX PAYER I.D. NUMBER _____

COMPANY WEB SITE ADDRESS_____E-MAIL _____

NUMBER OF LOCATIONS_____NUMBER OF PERSONS EMPLOYED_____

TYPE OF ORGANIZATION:

Public Corporation _ Private Corporation _ Sole Proprietorship _ Partnership Small Business

General Nature of Business _____

Manufacturer _____ Distributor _____ Retail_____ Dealer_____ Service_____

Not a Minority Owned Business____

Minority Owned Business:

African American _, Asian___, Hispanic _, American Indian _, Other _, Woman-Owned____

15. **SIGNATURE AND SEAL:**

DATED THIS_____DAY OF_____, 2016.

_____
LEGAL NAME OF PERSON, FIRM OR CORPORATION

_____
MAILING ADDRESS OF ABOVE

_____
SIGNATURE

_____
TELEPHONE NUMBER FAX NUMBER

_____
(Affix Corporate Seal here) E-MAIL

SECTION 00 41 10
BID TERMS AND CONDITIONS

REQUEST FOR BID CONDITIONS

In submitting a response to this Request for Bid, vendors hereby understand the following:

1. Pricing offered in the bid document will be provided to other local governments and governments whom Sedgwick County regularly enters into cooperative agreements.

2. Sedgwick County reserves the right to reject any and/or all bids and responses to these and/or related documents, to accept any item(s) in the bids, to waive any irregularity in the bids, and further if determined to be non-responsive in any form, or if determined to be in the best interest of Sedgwick County.

3. Alternate bids (two or more bids submitted) will be considered for an award. Sedgwick County reserves the right to make the final determination of actual equivalency or suitability of such bids with respect to requirements outlined herein. The bids submitted, and any further information acquired through interviews, will become and is to be considered a part of the final completed contract. If there is any variance or conflict, the bid specifications will control.

4. Bidders MUST return, completed copies of the entire document to the Sedgwick County Purchasing Department, 525 North Main, 8th Floor, Suite 823, Wichita, KS 67203, on or before the date and time specified. Bids must be sealed in an envelope and marked with the firm name and address, bid number, bid opening date, and bid opening time. The time clock stamp, located in the Sedgwick County Purchasing Department will determine the time of receipt.

5. Bids submitted may not be withdrawn for a period of 60 days immediately following the opening of this Request for Bid. Prices MUST be free of federal, state, and local taxes unless otherwise imposed by a governmental body, and applicable to the material on the bid.

6. Sedgwick County interprets the term "Lowest Responsible and Best Bidder" as requiring Sedgwick County to: (a) choose between the kinds of materials, goods, wares, or services subject to the bid, and (b) determine which bid is most suitable for its intended use or purpose. Sedgwick County can consider, among other factors, such things as the availability of service(s), part(s) material(s) and/or supply(s), warranty, maintenance, freight costs, performance of product and labor cost of items upon which bids are received.

7. All requested information must be supplied. If bidders cannot respond to any part of this request, bidders should state the reason they cannot respond and note an exception. Bidders may provide supplemental information to assist Sedgwick County in analyzing its bid.

8. If the bidder refuses or fails to make deliveries of the materials within the times specified on the face of the Request for Bid or purchase order, Sedgwick County may, by written notice, terminate the contract or purchase order.

9. The bidder will certify and warrant that goods, personal property, chattels, and equipment sold and delivered are free and clear of any and all liens, or claims of liens, for materials or services arising under, and by virtue of the provisions of K.S.A. Sections 58-201, et seq., and any other lien, right, or claim of any nature or kind whatsoever.

10. The successful bidder will hold and save Sedgwick County, and its officers, agents, servants/employees harmless from liability of any patented, or unpatented invention, process, article, or appliance manufactured, or used in the performance of the contract, including its use by Sedgwick County. Vendors working on county property or on behalf of County will be required to carry minimum insurance listed in bid document.

11. All items furnished, if applicable, must be the best of their respective kinds, and will be free from defects in material and workmanship. Items will be subject to County inspection and approval at any time within 30 days after delivery. If a substitution is made, it will be the decision of a Sedgwick County representative to determine if it is of equal quality. Items furnished must be manufactured in compliance with all existing legal or governmental directives.

12. Unless specified otherwise, all items bid are to be as a minimum but not necessarily limited to: new, current model year, and untitled prior to shipping and/or installation.

13. Sedgwick County is desirous of allowing as many Kansas vendors as possible the opportunity to participate including minority men and women-owned businesses, and small businesses in the roles of providing goods and services to Sedgwick County. If your company does not fall into any of these categories, your efforts to contract with vendors who do fall into these categories are appreciated. Construction projects utilizing subcontractors requires a subcontracting

worksheet. Contact purchasing department for details.

14. Contracts entered into on the basis of submitted bids are revocable if contrary to law.

15. County reserves the right to enter into agreements subject to the provisions of the Cash Basis Law (K.S.A. 10-1112 and 10-1113), the Budget Law (K.S.A. 79-2935). Agreements shall be construed and interpreted so as to ensure that the County shall at all times stay in conformity with such laws, and as a condition of agreements the County reserves the right to unilaterally sever, modify, or terminate agreements at any time if, in the opinion of its legal counsel, the Agreement may be deemed to violate the terms of such law.

16. The Bidder agrees to comply with K.S.A. 44-1030.
    a. The contractor shall observe the provisions of the Kansas act against discrimination and shall not discriminate against any person in the performance of work under the present contract because of race, religion, color, sex, disability, national origin, or ancestry;
    b. In all solicitations or advertisements for employees, the contractor shall include the phrase, "equal opportunity employer," or a similar phrase to be approved by the commission;
    c. If the contractor fails to comply with the manner in which the contractor reports to the commission in accordance with the provisions of K.S.A. 44-1031 and amendments thereto, the contractor shall be deemed to have breached the present contract and it may be canceled, terminated or suspended, in whole or in part, by the contracting agency;
    d. If the contractor is found guilty of a violation of the Kansas act against discrimination under a decision or order of the commission which has become final, the contractor shall be deemed to have breached the present contract and it may be canceled, terminated or suspended, in whole or in part, by the contracting agency; and
    e. The contractor shall include the provisions of subsections (a) through (d) in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor.

17. All project participants, consultants, engineers, contractors and subcontractors, must comply with all applicable Federal, State and County laws pertaining to contracts entered into by governmental agencies. All participants must comply with the Americans with Disabilities Act (ADA), including the 2008 ADA Amendments Act, and 2010 ADA Standards for Accessible Design.

18. Contractors/subcontractors performing new construction, maintenance, alterations, or additions to Sedgwick County buildings or facilities must comply with building guidelines/codes, and the 2010 ADA Standards for Accessible Design. Any violation of the provisions of the ADA or 504, or specification deficiencies, should be reported to the county's ADA coordinator. Failure to notify the county's ADA coordinator for remedy may be considered a breach of contract and may be grounds for cancellation, termination for suspension, in whole or in any part of the contract. All construction plans will have the county's ADA coordinator approval prior to beginning any work.

19. Contractors/vendors providing services to the public on behalf of Sedgwick County will agree that all personnel in their employment that have direct contact with the public will attend ADA Awareness and Sensitivity training provided by Sedgwick County or the Independent Living Resource Center. Training should be coordinated through the county's ADA coordinator, (316) 660-7052 and evidence of training shall be provided to the county's ADA coordinator. Any violations of the provisions of ADA or section 504, will be deemed a breach of contract and be subject to termination of contract.

20. The successful bidder may have access to private or confidential data maintained by the County to the extent necessary to carry out its responsibilities of the contract. Contractor shall be responsible for compliance with the privacy provision of the Health Insurance Portability and Accountability Act (HIPAA) and shall comply with all other HIPAA provisions and regulations applicable. If the successful bidder is a business associate as that term is defined under HIPAA, the contract shall include the County's standard business associate addendum. A copy of that standard addendum is available on request.

21. The bidder responding to this bid solicitation proposes to furnish all materials, labor, supplies, equipment and incidentals necessary to provide the equipment/materials/services described herein in accordance with the Notification of Solicitation (if applicable), Request for Information (if applicable), Request for Bid, Addenda, Contract, Bonds, Insurance, Plans, Specifications, any Instructions, Mandatory Requirements and Conditions.

22. Unless specified elsewhere in the document, all prices quoted must be F.O.B. Destination, Freight Prepaid and Allowed, which will include all delivery, handling, and any other charges related to delivery including surcharges.

23. It will be understood that the bidder's sureties and insurers, as applicable, are subject to the approval of the County.

24. Prior to a vendor being awarded a contract, Domestic (Kansas) corporations shall 1) furnish evidence of good standing

in the form of a Certificate signed by the Kansas Secretary of State. Foreign (non-Kansas) corporations shall furnish evidence of authority to transact business in Kansas, in the form of a Certificate signed by the Kansas Secretary of State; and 2) a copy of the Corporation Resolution evidencing the authority to sign the Contract Documents, executed by the Corporation's Secretary or Assistant Secretary.

25. Sedgwick County will not award to any vendor that is currently listed in the exclusion records of the SAM (System for Award Management) website maintained by the General Services Administration (GSA) or to any vendor presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency.

26. Upon award, the bidder agrees to execute and deliver to the County a contract in accordance with the contract documents (if applicable) within ten days of notice of the award to the bidder. The bidder agrees that the surety/deposit given concurrently herewith will become the property of the County in the event the bidder fails to execute and deliver such contract within the specified time. In the further event of such failure, the bidder will be liable for the County's actual damages that exceed the amount of the surety.

27. It will be understood that time is of the essence in the bidder's performance. The bidder agrees that the County's damages would be difficult or impossible to predict in the event of a default in the performance hereof; and it is therefore agreed that if the bidder defaults in the performance of the contract documents, the bidder will be liable for payment of the sums stipulated in the contract documents as liquidated damages, and not as a penalty.

28. The bidder hereby certifies that he or she has carefully examined all of the documents for the project, has carefully and thoroughly reviewed this Request for Bid, has inspected the location of the project (if applicable), and understands the nature and scope of the work to be done; and that this bid is based upon the terms, specifications, requirements, and conditions of the Request for Bid documents. The bidder further agrees that the performance time specified is a reasonable time, having carefully considered the nature and scope of the project as aforesaid.

29. It will be understood that any bid and any and/or all referencing information submitted in response to this Request for Bid will become the property of Sedgwick County, and will not be returned. As a governmental entity, Sedgwick County is subject to making records available for disclosure after Board of County Commission approval of the recommendation.

30. Sedgwick County will not be responsible for any expenses incurred by any vendor in the development of a response to this Request for Bid including any onsite (or otherwise) interviews and/or presentations, and/or supplemental information provided, submitted, or given to Sedgwick County and/or its representatives. Further, Sedgwick County will reserve the right to cancel the work described herein prior to issuance and acceptance of any contractual agreement/purchase order by the recommended vendor even if the Board of County Commissioners has formally accepted a recommendation.

31. By submission of a response, the bidder agrees that at the time of submittal, he or she: (1) has no interest (including financial benefit, commission, finder's fee, or any other remuneration) and will not acquire any interest, either direct or indirect, that would conflict in any manner or degree with the performance of bidder's services, or (2) benefit from an award resulting in a "Conflict of Interest". A "Conflict of Interest" will include holding or retaining membership, or employment, on a board, elected office, department, division or bureau, or committee sanctioned by and/or governed by the Sedgwick County Board of County Commissioners. Bidders will identify any interests, and the individuals involved, on separate paper with the response and will understand that the County, at the discretion of the Purchasing Director in consultation with the County Counselor, may reject their bid/quotation. The bidder certifies that this bid is submitted without collusion, fraud or misrepresentation as to other bidders, so that all bids for the project will result from free, open and competitive bidding among all vendors.

32. Sedgwick County will issue a purchase order/contract for the acquisition of products/services specified as a result of an award made in reference to this document. Contract documents will be subject to any regulations governed by the laws of the State of Kansas and any local resolutions specifically applicable to the purchase.

33. Any dispute arising out of the contract documents or their interpretation will be litigated only within the courts of the State of Kansas. No prepayment of any kind will be made prior to shipment. Payment will be made upon verification of delivery, compliance with specifications, assurance that the product/service performs as specified and warranted, and receipt of correct invoicing.

34. Sedgwick County will accept responses transmitted via a facsimile unless stated to the contrary within this document. Bids must be received prior to the time and dates listed to be considered responsive. Sedgwick County will not accept late responses and will return them to the sender. Further, Sedgwick County will NOT: (1) guarantee security of the document received; (2) be held responsible for Bids which are NOT legible (and may choose to reject such responses); and, (3) guarantee that the receiving facsimile machine will accept transmission or that phone lines are functioning and

available for transmission. Submitting a bid response via facsimile does NOT relieve the bidder of: (1) responsibilities stated in the document (such as attendance at a mandatory pre-bid conference); (2) providing non-paper informational items which must be returned with the response (diskettes, large drawings, photographs, models, etc.); and, (3) providing original copies of bid sureties (bonds, certificates of insurance, etc.).

END OF SECTION

SECTION 00 52 10
AGREEMENT

"Standard Form of Agreement Between Owner and Contractor for Construction of Projects of Limited Scope", AIA Document A107 as bound in this Project Manual.

DRAFT

AIA® Document A107™ – 2007

Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Sedgwick County Board of County Commissioners
525 N. Main
Wichita, Kansas 67203

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«Work Release Parking Lot, ADA, and Master Control Upgrade»
«701 E. Harry
Wichita, Ks 67213»
« »

The Architect:
(Name, legal status, address and other information)

«Mead and Hunt »« »
«10700 West Research Drive, Suite 155 »
«Wauwatosa, WI 53226 »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences.

attorney is encouraged with respect to its completion or modification.

DRAFT

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TABLE OF ARTICLES

ARTICLE 1 THE WORK OF THIS CONTRACT

The Contractor shall execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

Insert the following after the words "Contract Documents" in the first line: "listed in Article 6 of this Agreement or reasonably inferable by the Contractor from the Contract Documents as necessary to produce the results intended by the Contract Documents"

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

« »

Add the following: "The commencement date will be fixed in a notice to proceed."

§ 2.2 The Contract Time shall be measured from the date of commencement.

§ 2.3 The Contractor shall achieve Substantial Completion of the entire Work not later than « » (« ») days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

« »

Portion of Work	Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

« »

Delete the following: "the date of commencement, or as follows:"

Add the following: "the date fixed in a notice to proceed issued by the Owner."

Add the following new paragraphs:

2.3.1 All times stated in the Contract Documents, including, without limitation, those for the commencement, prosecution, interim milestones, and completion of the Work, and for the delivery and installation of materials and equipment, are of the essence in this Agreement.

2.3.2 The date of substantial completion of the Work or a designated portion thereof is the date, certified by the Architect, when construction is sufficiently complete in accordance with the Contract Documents that the Owner may, if it so elects, occupy and use the Work or designated portion thereof for the purposes for which it was intended.

2.3.3 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the following daily amounts commencing upon the first day following expiration of the Contract Time and continuing until the Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable pre-estimate of damages the Owner will incur as a result of delayed completion of the Work: Two Hundred Dollas and two cents ($200.02)

.

2.3.4 The Owner may deduct liquidated damages as described in the above paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at a rate equal to the lower of the Treasury bill rate or the highest lawful rate of interest payable by the Contractor.

ARTICLE 3 CONTRACT SUM

§ 3.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[« »] Stipulated Sum, in accordance with Section 3.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below

(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)
Add the word "proper" prior to the word "performance" in the first sentence; and insert at the end of the first sentence "and the completion of the Work".

§ 3.2 The Stipulated Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 3.2.1 The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 3.2.2 Unit prices, if any:
(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit ($0.00)

§ 3.2.3 Allowances included in the stipulated sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Allowance

§ 3.3 COST OF THE WORK PLUS CONTRACTOR'S FEE

§ 3.3.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

« »

§ 3.4 COST OF THE WORK PLUS CONTRACTOR'S FEE WITH A GUARANTEED MAXIMUM PRICE

§ 3.4.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

« »

§ 3.4.3 GUARANTEED MAXIMUM PRICE

§ 3.4.3.1 The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by changes in the Work as provided in the Contract Documents. Such maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

(Insert specific provisions if the Contractor is to participate in any savings.)

« »

§ 3.4.3.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

« »

§ 3.4.3.3 Unit Prices, if any:

(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit ($0.00)

§ 3.4.3.4 Allowances included in the Guaranteed Maximum Price, if any:

(Identify and state the amounts of any allowances, and state whether they include labor, materials, or both.)

Item	Allowance

§ 3.4.3.5 Assumptions, if any, on which the Guaranteed Maximum Price is based:

« »

ARTICLE 4 PAYMENTS

§ 4.1 PROGRESS PAYMENTS

§ 4.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 4.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

Delete the words "or as follows" from the last line and replace with "and the payment shall be less the specified retainage".

§ 4.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the date fixed above, payment shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

Delete existing Paragraph 4.1.3 and replace with the following: "Provided that an Application for Payments is received by the Architect not later than the twenty-fifth (25th) day of a month, the Owner shall make payment to the Contractor not later than the third Friday of the next month. If an Application for Payment is received by the Architect after the date fixed above, payment shall be made by the Owner not later than thirty (30) days after the Architect received the Application for Payment."

Add the following new clauses to Subparagraph 4.1.3:

4.1.3.1 Notwithstanding anything to the contrary in this Contract, payment of amounts due a Contractor from an Owner, except retainage, shall be made within 30 days after the Owner receives a timely, properly completed, undisputed request for payment according to terms of the contract, unless extenuating circumstances exist which would preclude approval of payment within 30 days. If such extenuating circumstances exist, than payment shall be made within 45 days after the Owner receives such payment request.

4.1.3.2 If the Owner fails to pay Contractor within the time period set in Paragraph 4.1.3.1, the Owner shall pay interest computed at the rate of eighteen percent (18%) per annum on the undisputed amount to the Contractor beginning on the day following the end of the time period set forth in Paragraph 4.1.2.1.

§ 4.1.4 Retainage, if any, shall be withheld as follows:

« »

§ 4.1.5 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

§ 4.2 FINAL PAYMENT
§ 4.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment;
.2 the contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a guaranteed maximum price; and
.3 a final Certificate for Payment has been issued by the Architect.

§ 4.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

ARTICLE 5 DISPUTE RESOLUTION
§ 5.1 BINDING DISPUTE RESOLUTION
For any claim subject to, but not resolved by, mediation pursuant to Section 21.3, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, claims will be resolved in a court of competent jurisdiction.)

[« »] Arbitration pursuant to Section 21.4 of this Agreement

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

Delete Article 5 in its entirety.

ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS
§ 6.1 The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 6.1.1 The Agreement is this executed AIA Document A107–2007, Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope.

§ 6.1.2 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

Delete the existing Paragraph 6.1.2 and replace with the following: "The Supplementary and other Conditions of the Contract are those modified and contained in the Project Manual dated" _____.

§ 6.1.3 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)
« »

Section	Title	Date	Pages

Include at the end of the paragraph: "Sections as listed in the Table of Contents of the Project Manual as dated as in Section 6.1.2."

§ 6.1.4 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)
« »

Number	Title	Date

§ 6.1.5 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are enumerated in this Article 6.

§ 6.1.6 Additional documents, if any, forming part of the Contract Documents:

.1 Exhibit A, Determination of the Cost of the Work, if applicable.

.2 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed, or the following:

« »

.3 Other documents:
(List here any additional documents that are intended to form part of the Contract Documents.)

« »

Include at the end of the paragraph: "Request for Bids, Invitation for Bids, Instructions to Bidders, Bid Form".

ARTICLE 7 GENERAL PROVISIONS

§ 7.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. The intent of the Contract Documents is to include all items necessary for the proper execution and

completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

Add the following at the end of Paragraph 7.1: "In the event of inconsistencies within or between parts of the Contracts Documents, or between the Contract Documents and applicable standards, codes, resolutions, and ordinances, the Contract shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation. The terms and conditions of this Paragraph 7.1, however, shall not relieve the Contractor of any obligations set forth in Paragraphs 9.1 and 9.6."

§ 7.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and the Contractor.

§ 7.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 7.4 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 7.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 7.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 7.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 7.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmission, unless otherwise provided in the Agreement or in the Contract Documents.

ARTICLE 8 OWNER

§ 8.1 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 8.1.1 The Owner shall furnish all necessary surveys and a legal description of the site.

§ 8.1.2 The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 8.1.3 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 9.6.1, the Owner shall secure and pay for other necessary approvals,

easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

Add new Paragraph 8.4

§8.4 EXTENT OF OWNER RIGHTS

§8.4.1 The rights stated in this Article 8 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (i) granted in the Contract Documents, (ii) in law, or (iii) in equity.

§8.4.2 In no event shall Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for the safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Document."

§ 8.2 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or repeatedly fails to carry out the Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order is eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

§ 8.3 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner, without prejudice to any other remedy the Owner may have, may correct such deficiencies and may deduct the reasonable cost thereof, including Owner's expenses and compensation for the Architect's services made necessary thereby, from the payment then or thereafter due the Contractor.

ARTICLE 9 CONTRACTOR

§ 9.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 9.1.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

Add the following at the end of Paragraph 9.1.1.: "Prior to execution of the Agreement, the Contractor and each Subcontractor evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climactic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Paragraph 16.2, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Paragraph 9.1.1."

§ 9.1.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 8.1.1, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies, or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.

Add the following new clauses to Subparagraph 9.1.2:

§9.1.2.1 The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Architect or the owner.

§9.1.2.2 The Contractor shall, therefore, satisfy itself to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 9.1.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 9.2 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 9.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.

§ 9.2.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

§ 9.3 LABOR AND MATERIALS

§ 9.3.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 9.3.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 9.3.3 The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification.

Add new Paragraph 9.3.4

§9.3.4 The Contractor shall deliver, handle, store and install materials in accordance with manufacturers' instructions.

§ 9.4 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation or normal wear and tear under normal usage.

Replace the word "may" with the word "shall" in the fifth line of Paragraph 9.4.

Insert the following at the end of Paragraph 9.4: "The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such a manner so as to preserve any and all such manufacturer's warranties."

§ 9.5 TAXES

The Contractor shall pay sales, consumer, use and other similar taxes that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

Add new Paragraph 9.5.1 MATERIALS:

§9.5.1 Materials and equipment incorporated into this Project are exempt from the payment of sales tax under the laws of the State of Kansas.

§9.5.2 The owner will provide the contractor with a proper exemption certificate number when the notice to proceed is issued. Should the Owner fail to provide an exemption certification the Contractor shall notify the Architect in writing prior to placing any orders. The contractor shall be reimbursed for sales tax amounts for which he becomes liable until such exemption is provided.

§9.5.3 Upon issuance of a proper exemption certification number to the Contractor, the Contractor shall assume full responsibility for his own assessed penalties relating to the Contractor's improper use of the exemption certificate. Contractor shall comply with statutes of the State of Kansas related to sales tax exemption.

§9.5.4 The Contractor shall be responsible for furnishing the Owner a copy of all invoices bearing the exemption certification number pertaining to materials that are incorporated in this project.

§9.5.5 Contractor shall retain, for a period of not less than five years, all his and his subcontractor's invoices claiming sales tax exemption, properly identified with tax exemption number as required by State of Kansas.

§9.5.6 Upon completion of the Project, the Contractor shall execute and issue, to the Owner, a certificate of compliance on the form provided by the State Department of Revenue.

§ 9.6 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 9.6.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as other permits, fees, licenses and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 9.6.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

Delete the existing Paragraph 9.6.2 and replace with the following: "The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules, regulations and lawful orders of public authorities applicable to performance of the Work. The Contractor shall promptly notify the Architect and Owner if the Drawings and Specifications are observed by the Contractor to be at variance therewith. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 9.7 ALLOWANCES

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Allowance amounts shall not include the Contractor's costs for unloading and handling at the site, labor, installation, overhead, and profit.

§ 9.8 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 9.8.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 9.8.2 The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Architect.

§ 9.9 SUBMITTALS

§ 9.9.1 The Contractor shall review for compliance with the Contract Documents and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them; (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so; and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Work shall be in accordance with approved submittals.

§ 9.9.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

§ 9.10 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

Add the following new Subparagraphs:

§9.10.1 Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

§9.10.2 The Contractor and any such entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

§9.10.3 Without limitation of any other provision of the Contract Documents, contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas and building adjacent to the site of the Work, and (ii) the Building, in the event of partial occupancy. Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

§9.10.3.1 Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all resolutions, rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended for time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such resolutions, rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same result intended by such portions of the resolutions, rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the resolutions, rules and regulations. In the even Owner requires compliance with subsequently adopted resolutions, rules and regulations, any resulting change in the Work shall be adjusted as provided in Article 13 of the Contract.

§9.10.4 The Contractor shall comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

§ 9.11 CUTTING AND PATCHING

The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

§ 9.12 CLEANING UP

The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus material from and about the Project.

§ 9.13 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 9.14 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 9.15 INDEMNIFICATION

§ 9.15.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.15.1.

Insert the following after parenthetical "(other than the Work itself)," in the fifth line of Subparagraph 9.15.1: "(including loss of use resulting therefrom)".

§ 9.15.2 In claims against any person or entity indemnified under this Section 9.15 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

Add the following new subparagraphs at the end of Paragraph 9.15:
§9.15.3 The Contractor's indemnity obligations under this Paragraph 9.15 shall also specifically include, without limitation, all fines, penalties, damages, liability, costs, and expenses (including, without limitation, reasonable attorney's fees) arising out of, or in connection with, any (i) violation of or failure to comply with any law, statute, resolution, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible, (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work, and (iii) failure to secure and pay for permits, fees, approvals, licenses, and inspections, as required under the Contract Documents, or any violation of any permit of other approval of a public authority applicable to the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible.

§9.15.4 The Contractor shall indemnify and hold harmless all of the Indemnitees from and against any costs and expenses (including reasonable attorneys' fees) incurred by any of the Indemnitees in enforcing any of the Contractor's defense, indemnity, and hold harmless obligations under this Contract.

ARTICLE 10 ARCHITECT

§ 10.1 The Architect will provide administration of the Contract and will be an Owner's representative during construction, until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 10.2 The Architect will visit the site at intervals appropriate to the stage of the construction to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general, if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 10.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 10.4 Based on the Architect's evaluations of the Work and of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 10.5 The Architect has authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

§ 10.6 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 10.7 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect will make initial decisions on all claims, disputes and other matters in question between the Owner and Contractor but will not be liable for results of any interpretations or decisions rendered in good faith.

§ 10.8 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

Add the following after the word "effect" in the first line of Subparagraph 10.8: ", in connection with administration of the Contract,"

§ 10.9 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

ARTICLE 11 SUBCONTRACTORS

§ 11.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site.

§ 11.2 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of the Subcontractors or suppliers for each of the principal portions of the Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 11.3 Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 12.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under conditions of the contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such claim as provided in Article 21.

§ 12.2 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's activities with theirs as required by the Contract Documents.

§ 12.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

Add the following new Subparagraphs:

§12.4 The Contractor shall, as part of the Work, provide for the coordination of work to be performed by each separate contractor engaged by the Owner, if any, with the work to be performed by the Contractor or its Subcontractors of any tier. The Contractor shall use its best efforts to cooperate with the Owner and all separate contractors, their subcontractors, and any other entity involved in the performance of the Work. In order to cause the Work and any work to be performed by separate contractors to be completed in an expeditious manner, the Contractor agrees that it will ensure that such separate contractors have a reasonable opportunity to complete their work as and when required.

§12.5 If any part of the Work depends on the proper performance of the work of a separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner any apparent discrepancies or defects in such other work that render it unsuitable and prevent the Contractor from proceeding expeditiously with the Work.

§12.6 If the Contractor wrongfully causes damage to the Work or the property of the Owner, the contractor shall promptly remedy such damage. If the Contractor wrongfully causes damage to the work or property of any separate contractor, the Contractor shall promptly attempt to settle any resulting dispute or claim with such other contractor.

ARTICLE 13 CHANGES IN THE WORK

§ 13.1 By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, with the Contract Sum and Contract Time being adjusted

accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor and Architect, or by written Construction Change Directive signed by the Owner and Architect.

§ 13.2 Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties or, in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment, and reasonable overhead and profit, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order.

§ 13.3 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

§ 13.4 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed.

Add the following at the end of Paragraph 13.4: "No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition that does not differ materially from those conditions disclosed or that reasonably should have been disclosed by the Contractor's (i) prior inspections, tests, reviews, and preconstruction services for the Project, or (ii) inspections, tests, reviews, and preconstruction services that the Contractor had the opportunity to make or should have performed in connection with the Project."

Add the following new Subparagraphs:

§13.5 Except as permitted in Paragraph 12.1, a change in the Contract Sum or the Contract Time shall be accomplished only by a Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§13.6 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule.

ARTICLE 14 TIME

§ 14.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 14.2 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 14.3 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 14.4 The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.4.3.

§ 14.5 If the Contractor is delayed at any time in the commencement or progress of the Work by changes ordered in the Work, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties or any causes beyond the Contractor's control, or by other causes which the

Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine, subject to the provisions of Article 21.

ARTICLE 15 PAYMENTS AND COMPLETION

§ 15.1 APPLICATIONS FOR PAYMENT

§ 15.1.1 Where the Contract is based on a Stipulated Sum or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values, allocating the entire Contract Sum to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used in reviewing the Contractor's Applications for Payment.

§ 15.1.2 With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor, less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 15.1.3 Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

§ 15.1.4 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or other encumbrances adverse to the Owner's interests.

Add the following new Subparagraph:

§ 15.1.5. Partial payments will be made monthly on proper application. Certification will be issued for ninety percent (90%) of the amount requested by the Contractor and approved by the Architect to be properly due until at least fifty percent (50%) of the Contract amount has been paid. Thereafter, the accumulated retainage will remain at five percent (5%) of the Contract amount (including additions, if any) except that should the Contractor at any time fail to keep current with the approved progress schedule, certification of ninety percent (90%) shall automatically again become effective and shall apply so long as the Contract progress lags behind such progress schedule.

§ 15.2 CERTIFICATES FOR PAYMENT

§ 15.2.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.2.3.

§ 15.2.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluations of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 15.2.3 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 15.2.2

cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 15.2.1. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 9.2.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a separate contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 15.2.4 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 15.3 PROGRESS PAYMENTS

§ 15.3.1 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to sub-subcontractors in similar manner.

§ 15.3.2 Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 15.3.3 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 15.4 SUBSTANTIAL COMPLETION

§ 15.4.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 15.4.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 15.4.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. When the Architect determines that the Work or designated portion thereof is substantially complete, the Architect will issue a Certificate of Substantial Completion which shall establish the date of Substantial Completion, establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 15.4.4 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 15.5 FINAL COMPLETION AND FINAL PAYMENT

§ 15.5.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions stated in Section 15.5.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

Add the following at the end of Subparagraph 15.5.1: "All warranties, guarantees, operational and parts manuals required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Architect as part of the final Application for Payment. The final certificate of Payment will not be issued by the Architect until all warranties and guarantees have been received and accepted by the Owner."

§ 15.5.2 Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including costs and reasonable attorneys' fees.

§ 15.5.3 The making of final payment shall constitute a waiver of claims by the Owner except those arising from

.1 liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents; or
.3 terms of special warranties required by the Contract Documents.

§ 15.5.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

§ 16.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons and property and their protection from damage, injury or loss. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 16.1.2 and 16.1.3, except for damage or loss attributable to acts or omissions of the Owner or Architect or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 9.15.

Add the following at the end of Paragraph 16.1: "When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, from injury by any cause. The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and statements of

any witnesses. In addition, if death, serious personal injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect."

§ 16.2 HAZARDOUS MATERIALS

§ 16.2.1 The Contractor is responsible for compliance with the requirements of the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shutdown, delay and start-up.

§ 16.2.2 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area, if in fact, the material or substance presents the risk of bodily injury or death as described in Section 16.2.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

Delete Subparagraph 16.2.2 in its entirety.

§ 16.2.3 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

Delete Subparagraph 16.2.3 in its entirety.

ARTICLE 17 INSURANCE AND BONDS

§ 17.1 The Contractor shall purchase from, and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, insurance for protection from claims under workers' compensation acts and other employee benefit acts which are applicable, claims for damages because of bodily injury, including death, and claims for damages, other than to the Work itself, to property which may arise out of or result from the Contractor's operations and completed operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or anyone directly or indirectly employed by any of them. This insurance shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater, and shall include contractual liability insurance applicable to the Contractor's obligations under Section 9.15. Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. The Contractor shall cause the commercial liability coverage required by the Contract Documents to include: (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 17.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

Delete Paragraph 17.2 in its entirety

§ 17.3 PROPERTY INSURANCE

§ 17.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance on an "all-risk" or equivalent policy form, including builder's risk, in the amount of the initial Contract Sum, plus the value of subsequent modifications and cost of materials supplied and installed by others, comprising total value for the entire

Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 15.5 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 17.3.1 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and sub-subcontractors in the Project.

Delete the word "Owner" in the first line and replace with "Contractor";

Delete the phrase "Property insurance on an "all risk" or equivalent policy form, including builder's risk" in the second and third lines and replace with the following: "builder's risk insurance, with a deductible not to exceed $1,000."

Delete the word "property" in the fifth line and replace with the words "builder's risk."

§ 17.3.2 The Owner shall file a copy of each policy with the Contractor before an exposure to loss may occur. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

Delete the first sentence and replace with the following: "The Contractor shall file a copy of each policy with the Owner before an exposure to loss may occur."

Delete the word "Contractor" in the last line and replace with the word "Owner."

§ 17.3.3 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 12, if any, and any of their subcontractors, sub-subcontractors, agents and employees for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to Section 17.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 12, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

Delete Paragraph 17.3.3. in its entirety.

§ 17.3.4 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their sub-subcontractors in similar manner.

§ 17.4 PERFORMANCE BOND AND PAYMENT BOND

§ 17.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 17.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 18 CORRECTION OF WORK

§ 18.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or

not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense, unless compensable under Section A.2.7.3 in Exhibit A, Determination of the Cost of the Work.

Add the following at the end of Subparagraph 18.1: "If prior to the date of Substantial Completion, the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner."

Definition of SUBSTANTIAL COMPLETION: a project is substantially complete when the Owner can legally take occupancy and use the facility for its intended purpose.

§ 18.2 In addition to the Contractor's obligations under Section 9.4, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 15.4.3, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty.

Delete all language starting with the words "and to" and continuing through the word "warranty" in the last line of Paragraph 18.2.

Add the following last sentence to Paragraph 18.2 "The Owner shall, prior to making any written claim, provide the Contractor with an opportunity to make the corrections."

§ 18.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

§ 18.4 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 18.5 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Article 18.

Delete existing Paragraph 18.5 in its entirety and replace with the following: "Upon completion of any Work under or pursuant to this Article 18, the one (1) year correction period in connection with the Work requiring correction shall be renewed and recommence. The obligations under Article 18 shall cover any repairs and replacement to any part of the Work or other property caused by the defective Work."

ARTICLE 19 MISCELLANEOUS PROVISIONS

§ 19.1 ASSIGNMENT OF CONTRACT

Neither party to the Contract shall assign the Contract without written consent of the other, except that the Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 19.2 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located, except, that if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 21.4.

§ 19.3 TESTS AND INSPECTIONS

Tests, inspections and approvals of portions of the Work required by the Contract Documents or by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating the costs to the Contractor.

§ 19.4 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 19.4.

Delete Paragraph 19.4 in its entirety.

ARTICLE 20 TERMINATION OF THE CONTRACT

§ 20.1 TERMINATION BY THE CONTRACTOR

If the Architect fails to certify payment as provided in Section 15.2.1 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 4.1.3 for a period of 30 days, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 20.2 TERMINATION BY THE OWNER FOR CAUSE

§ 20.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 20.2.2 When any of the above reasons exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven days' written notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 20.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 20.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 20.3 TERMINATION BY THE OWNER FOR CONVENIENCE

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

Add following new paragraphs:

§20.3.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§20.3.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall;

§20.3.2.1 cease operations as directed by the Owner in the notice;

§20.3.2.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

§20.3.2.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§20.3.3 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered, and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits. Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the work, (ii) claims that the Owner has against the Contractor under the Contract, and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum."

ARTICLE 21 CLAIMS AND DISPUTES

§ 21.1 Claims, disputes and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision. Such matters, except those waived as provided for in Section 21.8 and Sections 15.5.3 and 15.5.4, shall, after initial decision by the Architect or 30 days after submission of the matter to the Architect, be subject to mediation as a condition precedent to binding dispute resolution.

Add the following at the end of the first sentence in Subparagraph 21.1: "if the claimant recognizes the claim prior to the date of final payment."

Delete the following: "Such matters except those waived as provided for in Section 21.8 and Sections 15.5.3 and 15.5.4 shall, after initial decision by the Architect or 30 days after submission of the matter to the Architect, be subject to mediation as a condition precedent to binding dispute resolution."

Add the following: "The Contractor and Owner shall not be obligated to resolve any claim, dispute or other matters related to the contract by mediation or arbitration. Any reference in the contract documents to mediation or arbitration is deemed void."

§ 21.2 If a claim, dispute or other matter in question relates to or is the subject of a mechanic's lien, the party asserting such matter may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

Delete Paragraph 21.2 in its entirety.

§ 21.3 The parties shall endeavor to resolve their disputes by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with their Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to this Agreement, and filed with the person or entity administering the mediation. The request may be made concurrently with the binding dispute resolution but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

Delete Paragraph 21.3 in its entirety.

§ 21.4 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any claim, subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association, in accordance with the Construction Industry Arbitration Rules in effect on the date of this Agreement. Demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

Delete Paragraph 21.4 in its entirety.

§ 21.5 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation; (2) the arbitrations to be consolidated substantially involve common questions of law or fact; and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

Delete Paragraph 21.5 in its entirety.

§ 21.6 Any party to an arbitration may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described in the written Consent.

Delete Paragraph 21.6 in its entirety.

§ 21.7 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

Delete Paragraph 21.7 in its entirety.

§ 21.8 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 20. Nothing contained in this Section 21.8 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

Delete Paragraph 21.8 in its entirety.

ARTICLE 22 OTHER CONDITIONS OR PROVISIONS

Add the following paragraphs:

§22.1 Contractor shall observe the provisions of the Kansas Acts Against Discrimination and shall not discriminate against any person in the performance of work under the present agreement because of race, religion, color, sex, disability, national origin or ancestry.

§22.2 In all solicitation or advertisements for employees, Contractor shall include the phrase "equal opportunity employer" or a similar phrase to be approved by the Kansas Human Rights Commission.

§22.3 If Contractor fails to comply with the manner in which Contractor reports to the Kansas Human Rights Commission in accordance with the provisions of K.S.A. 44-1031 and amendments thereto, Contractor shall be deemed to have breached the present contract and it may be canceled, terminated, or suspended in whole or in part, by Sedgwick County (Owner).

§22.4 If Contractor is found guilty of a violation of the Kansas Acts Against Discrimination under a decision of order of the Kansas Human Rights Commission which has become final, Contractor shall be deemed to have breached the present agreement and it may be canceled, terminated or suspended, in whole or in part, by Sedgwick County (Owner).

§22.5 Contractor shall include the provisions of the above paragraphs 22.1 through 22.4, inclusively, in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor."

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	CONTRACTOR *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

Approved as to Form:

Robert W. Parnacott

Attest:

Kelly B. Arnold
County Clerk

SECTION 00 61 10
PERFORMANCE LABOR AND MATERIAL BONDS

PERFORMANCE AND LABOR AND MATERIAL BONDS:

PERFORMANCE AND LABOR AND MATERIAL BONDS shall be furnished to the Owner by the Contractor, in an amount equal to 100 percent of the Contract Sum as security for the faithful performance of the contractor and payment of all persons performing labor and furnishing materials in connection with the contract. Said payment bond shall also be executed as a statutory bond and filed in the office of the Clerk of the District Court of the County in which the Project is located. Contractor shall provide the Owner with a certified copy of said statutory bond as so filed.

BONDS FURNISHED shall be written by a SURETY approved by the U.S. Treasury Dept. and licensed to do business in the State of Kansas. No Work shall be commenced until bonds are in force.

FORM OF BOND shall be Statutory Payment Bond – State of Kansas.

POWER OF ATTORNEY for the surety company agent must accompany each bond issued, and must be certified to include the date of the bonds.

PROVIDE TRIPLICATE COPIES of the bond forms and power of attorney.

COST of the bonds shall be included in the bid and paid for by the Contractor.

END OF SECTION

SECTION 00 61 20
BOND TO THE STATE OF KANSAS
STATUTORY PAYMENT BOND
(K.S.A. 60-1111, as amended)

WITNESSETH: That _____ ("Principal"), and _____ ("Surety"), are hereby jointly and severally held and firmly bound unto the STATE OF KANSAS in the sum of _____ dollars ($_____) lawful money of the United States of America, for the use and benefit of all persons entitled thereto and for the payment of which we hereby bind ourselves, our successors, assigns, heirs, executors and administrators.

THE CONDITION OF THE OBLIGATION IS SUCH, THAT,

WHEREAS, the Principal has entered into an Agreement with Sedgwick County, Kansas dated _____, 2015, for improvements described as the

SEDGWICK COUNTY WORK RELEASE CENTER
PARKING LOT, ADA AND MASTER CONTROL UPGRADE
701 W. HARRY
WICHITA, KS 67213

(the "Work") according to the Contract Documents, which are incorporated herein by reference.

NOW, THEREFORE, if the Principal and its subcontractors shall pay all indebtedness incurred for supplies, materials or labor furnished, used or consumed in connection with the Work including gasoline, lubricating oils, fuel oils, grease, coal and similar items used or consumed directly in furtherance of the Work, then this obligation is to be null and void; otherwise to remain in full force and effect.

The Surety covenants and agrees that no change, extension of time, alteration or addition to the Contract Documents or to the Work shall in any way reduce, nullify, or affect the Surety's obligations on this bond; and the Surety hereby waives notice on any such change, extension of time, alteration or additional to said Contract Documents or Work.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed and delivered this _____ day of _____, 2015.

Principal _____

Title _____

Surety _____

Title _____

SECTION 00 61 30
PERFORMANCE BOND

WITNESSETH THAT,_____("Principal") and _____("Surety") ARE HELD AND FIRMLY BOUND UNTO THE BOARD OF COUNTY COMMISSIONERS OF SEDGWICK COUNTY, KANSAS, (the "County"), for the use and benefit of claimants herein below identified in the amount of:

_____dollars ($_____). and in the amount of any change orders issued for the Work, for which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT,

> WHEREAS, Principal has by agreement dated_____, 2015 entered into a contract with the County for the construction described as SEDGWICK COUNTY WORK RELEASE CENTER, 701 W. HARRY, WICHITA, KS 67213 in accordance with the Contract Documents.

NOW, THEREFORE, if the Principal shall well and truly perform all the covenants, conditions, and obligations of the Contract Documents and any Addenda and Change Orders and shall hold the County and all interested property owners harmless against all claims, loss, damage, demands, or causes of actions which they may sustain or suffer by reason of any breach of said Contract Documents or of negligence of the Principal or of improper execution of the Work or use of inferior materials by the Principal; and if said Principal shall maintain the improvements as provided for in said Contract Documents and shall make good all defects in material and workmanship for a period of one year, or for such other period as provided for in the Contract Documents; then, this obligation shall be void: Otherwise to remain in full force and effect.

FURTHERMORE, the Surety convents and agrees that no price change, extension of time, alteration, or addition to the terms of the Contract Documents or to the Work to be performed thereunder shall in any way affect Surety's obligation on this bond; and Surety hereby waives notice of any such change, extension of time, alteration or addition to said Contract Documents.

IN WITNESS WHEREOF, the Principal and Surety have duly executed these presents all as of the day and year first above written.

Principal _____

Title _____

Surety _____

Title _____

SECTION 00 67 10
CERTIFIED COPY OF A RESOLUTION
OF THE BOARD OF DIRECTORS
OF _____
A KANSAS CORPORATION

The undersigned, being the duly elected qualified and acting Secretary of _____, a Kansas corporation (the "Corporation"), hereby certifies as follows:

At a special meeting of the board of directors of the Corporation, held _____, 2016, when meeting was duly and properly called according to the by-laws of the Corporation and at which a quorum of said board was present, the following resolution was passed and adopted:

"WHEREAS, the Corporation desires to contract with Sedgwick County, Kansas (the "County") for the construction of certain public improvements, and,

"WHEREAS, the Corporation desires to authorize certain officers of the Corporation to execute and deliver to the County all agreements and documents related thereto.

"NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF _____, a Kansas corporation, that _____(name),_____(title), of the Corporation, be and is hereby authorized to execute and deliver to the County all contracts and documents incidental thereto, including but not limited to statutory bonds, construction bonds, insurance agreements and policies, plans and specifications, and any further documents required thereby, relating or pertaining to the following described project:

SEDGWICK COUNTY WORK RELEASE CENTER
PARKING LOT, ADA AND MASTER CONTROL UPGRADE
701 W. HARRY
WICHITA, KS 67213

"BE IT FURTHER RESOLVED BY THE BOARD OF DIRECTORS OF THE CORPORATION that the authority conferred hereby upon such officer is continuing unless notice in writing be given by the Corporation to the County."

DATED this_____day of_____, 2016.

_____
Secretary

(SEAL)

PROJECT SUBCONTRACTING WORK SHEET

Project Name SEDGWICK COUNTY WORK RELEASE CENTER
PARKING LOT, ADA AND MASTER CONTROL UPGRADE

Check here if you are not using subcontractors ____

Bid #	16-0031
General Contractor	
Created by	

General Contractors shall provide the name, description, DBE classification (type) Minority Certification #, date of work and dollar value for each subcontractor (including lower-tier subcontractors) used to complete the referenced project. Contractors may be required to provide back up documentation to verify information. Each column requires input.

DBE classification type: African American (1); Asian (2); Hispanic (3); Native American (4); other minority (5); Women Owned Business (6). Additional general classifications: Small Business Owner (7); Does not meet any classification (8).

	Subcontractor Name and Address	Type	Jurisdiction Name & Minority Certification # (if vendor has one)	Description of Services	Date of Work	Dollar Value of work
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Form shall be submitted to Purchasing at the completion of project.

SECTION 00 72 00
GENERAL CONDITIONS

REFERENCE STANDARD AIA DOCUMENT

The "General Conditions of the Contract for Construction", AIA Document A201, 2007 Edition, is not bound in this Project Manual, but is included by this reference; is a part of the Contract; and is incorporated herein as fully as if here set-forth.

SECTION 00 73 16
INSURANCE REQUIREMENTS

The Contractor shall carry and maintain coverage as follows:

WORKER'S COMPENSATION

Applicable State: ..... Statutory
Employer's Liability:..... $100,000

CONTRACTOR'S LIABILITY INSURANCE. Form of insurance shall be a Comprehensive General Liability Automobile Liability.

1. BODILY INJURY
   Each Occurrence:.....$500,000
   Aggregate:..... $500,000

2. PROPERTY DAMAGE
   Each Occurrence:.....$500,000
   Aggregate:..... $500,000

3. PERSONAL INJURY
   Each Person Aggregate: $500,000
   General Aggregate:.....$500,000

4. AUTOMOBILE LIABILITY. Owned, non-owned and hired.
   Bodily Injury, Each Person:.....$500,000
   Bodily Injury, Each Occurrence:.....$500,000
   Property Damage, Each Occurrence:.....$500,000

5. PROFESSIONAL LIABILITY:
   (Architects/Engineers).....$500,000

XCU Coverage

Remove Exclusion.

BUILDER'S RISK INSURANCE

In the amount of the initial Contract Sum, plus the value of subsequent modifications and cost of materials supplied and installed by others, comprising the total value for the entire Project on a replacement cost basis without optional deductibles.

UMBRELLA COVERAGE

Following form for both the general liability and automobile: $500,000

END OF EXHIBIT A

SECTION 01 10 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract comprises upgrades to the existing parking lot, intake holding cells and replacement of the existing security electronics system.

1.2 OWNER FURNISHED ITEMS

A. Distributed UPS system as required for security PC-tower workstations located at Officer control areas as shown on the Security Electronics Drawings.

1.3 OWNER OCCUPANCY

A. The Contractor shall note that this is a 24-hour operating detention center. The Owner will continue to occupy the building for normal jail uses. Cooperate with the Owners in all construction operations to minimize interference and conflict with the use of the premises by the Owners. The Contractor is responsible for maintaining access to exits to provide safe egress from the units.

1.4 DELIVERY AND STORAGE

A. The Contractor will be responsible for providing the necessary equipment to receive and off-load deliveries on site.

B. Exterior storage is not allowed. All materials must be stored either inside the building within an area designated by the Owner or in an exterior lockable container.

END OF SECTION

SECTION 01 14 20
CONTRACTOR GUIDELINES

PART 1 - GENERAL

1.1 BACKGROUND CHECKS

A. Background checks will be performed on all Contractors performing work on site.

B. No labor personnel will be allowed on site without prior clearance by the Owner.

C. The Contractor will be responsible for coordinating background checks of all labor parties in advance of their arrival with the Owner.

D. The Contractor will be responsible for coordinating background checks of new labor personnel with the Owner within a minimum of 48 hours in advance of their arrival.

E. The Owner will not be held responsible for lost time or wages for labor personnel not cleared within 48 hours in advance of their arrival.

1.2 CONTRACTOR GUIDELINES

A. Contractors must sign-in with Work Release Center Administration upon arrival to the facility. Contractors must sign-out Work Release Center Administration upon leaving the facility.

B. Work Release Center Maintenance will check-in all equipment and tools. All equipment and tools must be check-out by Work Release Center Maintenance as the items are removed from the facility. In the event that equipment or tools are missing, the contractors will not be allowed to leave the facility until all items are accounted for.

C. Contractors working in Inmate areas will be briefed on inmate confidentiality, security procedures and their responsibilities under the Prison Rape Elimination Act. The Detention Bureau will

D. Contractors will be taken to Master Control and introduced to Work Release Center Staff. Work Release Center Staff will be notified of where contract personnel will be working.

E. Tools and materials shall not be left unattended at anytime. Tools and materials can be used by inmates to harm themselves or others. In the event an items is discovered to be missing (tools, materials, etc.) it is the Contractor's responsibility to notify Work Release Center Staff immediately. A minimal amount of secure storage is available for storage of tools and materials.

F. Contractors must leave any unnecessary tools or personal belongings in their vehicles. Do not provide smoking materials, matches or money to any inmate.

G. All construction material and salvage material shall be removed from the facility or secured at the end of each day.

H. Contractors are asked that they do not work at the facility if they are ill with something contagious

I. All contractors are expected to leave work areas in conditions; such that the area can be occupied area can be occupied immediately upon leaving the area. Brooms, dustpans, and mops will be provided for clean up.

J. Smoking is prohibited inside County buildings.

K. The Sedgwick County Work Release Center will supply two escorts for the duration of the project. If there is a change in the schedule, 48 hour notice would be appreciated.

L. Any Contractor employee, or group of employees, inside the inmate occupied area of the jail must be in the presence of one of the two assigned escorts at all times. It will not be required to have escort present when working non-inmate occupied areas.

1.3 OWNER DISMISSAL

A. The Owner reserves the right at any time to dismiss from the premises any Contractor or construction personnel that do not uphold the requirements of this Section.

B. The Owner shall not be held liable for any lost time, wages, or impacts to the construction schedule by any Contractor or construction personnel dismissed for failure to uphold the requirements of this Section.

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 ALTERNATE NO. 1

A. Provide lump sum price to provide ADA holding cell improvements as shown.

1.2 ALTERNATE NO. 2

A. Provide lump sum price to provide detention door improvements as shown.

1.3 ALTERNATE NO. 3

A. Provide lump sum price to provide facility-wide paging system as shown.

1.4 ALTERNATE NO. 4

A. Provide lump sum price to provide floor improvements in Dormitories as shown.

1.5 ALTERNATE NO. 5

A. Provide lump sum price to provide floor improvements in Administration as shown.

PART 2 - ALTERNATE SELECTION

2.1 PRECEDENCE

A. Sedgwick County reserves the right to select Alternate Bids in any order as deemed as necessary based on project budget and Owner requirements. Selection of Alternate bids chosen or rejected under the full discretion of the Owner.

END OF SECTION

SECTION 01 31 00
PROJECT COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The Contractor shall assume and take responsible charge of the place of the project and shall coordinate the work of each Subcontractor to complete the project in an orderly and timely manner.

B. The Contractor shall coordinate the work of his own employees, expedite his work to assure compliance with schedules, coordinate his work with that of Subcontractors and work by the Owner.

1.2 COORDINATION PROCEDURES

A. Cooperate with the Owner, Engineer and all other persons of all trades engaged in the work in such a manner and to such extent as will best facilitate the work of each and the prompt completion of the work.

B. Order materials and let subcontracts promptly and schedule and expedite work so as to avoid delay.

C. The Contractor shall bring to the immediate attention of the Owner and Engineer, any conflict relative to coordinating the work of the subcontractors.

D. Notify the Owner and Engineer of any unforeseen conditions found in the field.

E. The Contractor shall note that this is a 24-hour operating correctional facility. The Owner will continue to occupy the building for normal jail uses. Cooperate with the Owners in all construction operations to minimize interference and conflict with the use of the premises by the Owners. The Contractor is responsible for maintaining access to exits to provide safe egress from the units.

F. Contractor to comply with Sedgwick County rules and relations for conducting work in an occupied facility.

1.3 EXAMINATION OF DOCUMENTS

A. The drawings show the general arrangement, quantity, extent and location of the work. The specifications describe the materials, systems, standards and quality required for the work. Examine the drawings and the specifications applicable to the contract. Bring to the attention of the Engineer any questions with regard to the intent of these documents, in a timely manner prior to commencing with the work.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 MEETINGS

A. The Engineer will administer weekly project meetings and shall:
   1. Prepare agenda for meetings.
   2. Distribute written notice of each meeting four days in advance of meeting date.
   3. Make physical arrangements for meetings.
   4. Preside at meetings.
   5. Record the minutes including significant proceedings and decisions.
   6. Reproduce and distribute copies of minutes within three days after each meeting:
   a. To participants in the meetings.
   b. To parties affected by decisions made at the meetings.

B. Project meetings may be held weekly during periods of high activity.

C. Representatives of Contractors, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

D. Owner's Representative will meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.2 PRE-CONSTRUCTION MEETING

A. Soon after award of Contract and prior to the start of construction, each Contractor shall attend a pre-construction conference with representatives of the Owner and A/E. This meeting will be scheduled by the Engineer.

B. Requirements for contract administration and construction operations will be defined for participants.

C. Time, date and place of the conference will be determined by the Owner's Representative.

D. The pre-construction meeting shall be attended by the Owner, Engineer, Prime Contractors' Superintendents, and Others as appropriate.

E. Suggested meeting agenda shall be:
   1. Distribution and discussion of:
   a. List of major subcontractors and suppliers.
   2. Projected Construction Schedules.
   a. Critical work sequencing.
   b. Major equipment deliveries and priorities.
   c. Project Phasing
   3. Project Coordination.
   a. Designation of responsible personnel.
   4. Adequacy of distribution of Contract Documents.
   5. Procedures for maintaining use of premises:
   a. Parking
   b. Job Trailers
   c. Office, Work and Storage Areas

d. Owner's Requirements
6. Construction facilities, controls and construction aids.
7. Temporary utilities.
8. Safety and first-aid procedures.
9. Fabrication area
10. Security procedures.
11. Housekeeping procedures.

1.3 PROGRESS MEETINGS

A. Project meetings will be held at the project site by the Engineer's representative for the purpose of coordinating and expediting the Work progress.

B. Meetings will be scheduled by the Prime Contractor with timely notification of all Contractors.

C. The progress meeting shall be attended by the Engineer, Prime Contractors, Owner, Subcontractors as appropriate to the agenda and suppliers as appropriate to the agenda.

D. Suggested meeting agenda shall be:
1. Review and approval of minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Field observations, problems and conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication and delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Progress and schedule during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules and expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
a. Effect on Construction Schedule and on completion date.
b. Effect on other contracts of the Project
c. Other business.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 GENERAL

A. Refer to General Conditions for basic requirements for all submittals.

B. Refer to technical specifications for all submittals required.

1.2 PROGRESS SCHEDULE

A. Contractor shall submit copies of the project construction schedule to the Owner and Engineer for approval within 10 days after award of contract.

B. Include in schedule:
   1. Breakdown of work activities, segmented as necessary to allow monitoring of progress of the work during construction.
   2. Order of work necessary to meet time for completion.
   3. Breakdown of the work of Subcontractors scheduled in cooperation with the Contractor's work.
   4. Space for the additional display of actual performance on the schedule.

C. After necessary revisions and approval by the Owner, provide one copy of the project construction schedule to each subcontractor, one copy to the Owner, and one copy to the Engineer.

D. Upon request of the Engineer, update the schedule to reflect changes required by actual conditions and indicate actual work completed. Show changes occurring since previous submission of schedule such as:
   1. Major changes in scope;
   2. Activities modified since previous submission;
   3. Revised projections of progress and completion;
   4. Other identifiable changes.

E. At the Contractor's option he may submit a CPM or PERT project schedule containing all information required by this section.

F. The Contractor shall submit a progress report at the end of each billing period using the construction schedule described.

G. This report should indicate the actual progress for items of work completed as compared to that scheduled.

H. Where work is not performed according to the construction schedule, a short narrative should be written describing the cause of delay and intended action to remedy the delay.

I. When the work performed is not meeting the construction schedule, the Engineer may request that the Contractor increase the labor and equipment being furnished in order to meet the schedule. Should the Contractor choose not to follow the Engineer's request he shall provide a written submittal explaining how the schedule is to be met without an increase in labor and equipment.

1.3 SUBCONTRACTOR AND MATERIALS LIST

A. The subcontractor and major material suppliers list shall be submitted prior to awarding of the contract.

B. The Owner will promptly review list and indicate in writing approval or disapproval of subcontractors and materials. Resubmit revised list upon disapproval of any item until such time as approval of all items has been obtained from the Owner.

C. Use of unspecified or unapproved materials and equipment will not be permitted.

D. Certificate of payment may be withheld by the Engineer until complete approval of subcontractors and materials list has been obtained.

1.4 SCHEDULE OF VALUES

A. Within 10 days after award of the contract, the Contractor shall submit to the Engineer a schedule of values of the various portions of the work, including quantities if required by the Engineer, aggregating the total contract sum, divided so as to facilitate payments to Subcontractors.

B. Prepare a schedule of values in such form and supported by such substantiating data as the Engineer may require. Each item in the schedule of values shall include its proper share of overhead and profit. This schedule when approved by the Engineer shall be used only as a basis for the Contractor's applications for payment.

C. Certificate of payment may be withheld by the Engineer until receipt of schedule of values in an acceptable form has been submitted.

1.5 SUBMITTAL REQUIREMENTS

A. Schedule submittals at least 15 working days before the time that reviewed and approved submittals will be needed.

B. Submit all shop drawings, product data and samples to the Engineer.

C. Accompany submittals with transmittal letter containing the date, project title and number, Contractor's name and address, the quantity of items submitted, notifications of any deviations from contract documents, the section of work and other pertinent data.

1.6 SHOP DRAWINGS

A. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any Subcontractor, manufacturer, supplier or distributor and which illustrate some portion of the work.

B. When shop drawings consist of illustrations, performance charts, brochures or other data in printed form, submit four copies for review. Increase the number of copies where so stated in the technical specifications.

C. Identify with A&O project number, name of project, Engineer, Contractor, fabricator, specification section number and detail number(s) to which drawing pertains. Date and number each sheet of shop drawings consecutively. Provide open space 3" x 5" for Engineer's stamp on each drawing.

D. Provide all supporting data to show compliance with specifications.

E. Shop drawings must be original. No reproductions of Engineer's drawings will be accepted.

F. All shop drawings shall be reviewed, stamped and approved by appropriate Contractor prior to Engineer's review. All shop drawings which are not stamped by the Contractor will be returned by Engineer unchecked.

G. Check and note all errors on shop drawings prior to submitting to Engineer. At the time of submission the Contractor shall inform the Engineer in writing of any deviation in the shop drawings from the requirements of the contract documents.

H. By approving and submitting shop drawings, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data or will do so, and that he has checked and coordinated each shop drawing with the requirements of the work and of the contract documents.

I. Engineer will review shop drawings with reasonable promptness, make necessary notations and return to Contractor for correction by supplier or fabricator. The Engineer will review and approve shop drawings only for conformance with the design concept of the project and with the information given in the contract documents. The Engineer's approval of a separate item shall not indicate approval of an assembly in which the item functions.

J. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies until approved. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the Engineer on previous submissions.

K. After correction, supplier or fabricator shall provide prints of all shop drawings to the Contractor as required for distribution and use.

L. Original submissions returned "disapproved" shall be resubmitted as originally required and approval obtained prior to furnishing copies for distribution.

M. Shop drawings used at site must bear approval stamp of both the Engineer and Contractor.

N. Shop drawing approvals do not constitute a waiver of detailed or specified requirements of the drawings and specifications.

O. No portion of the work requiring a shop drawing submission shall be commenced until the submission has been approved by the Engineer. All such portions of the work shall be in accordance with approved shop drawings.

P. At completion of all work prior to final payment furnish Owner with one unused copy of all approved shop drawings, manufacturer's brochures, diagrams or similar material used in execution of the work. Refer to section 01700.

1.7 SAMPLES

A. Samples are physical examples furnished by the Contractor to illustrate materials, equipment or workmanship, and to establish standards by which the work will be judged.

B. Submit in duplicate.

C. Identify with A&O project number, name of project, Engineer, Contractor, fabricator and specification section reference.

D. Provide samples of sufficient size to permit an accurate appraisal of color, texture, finish, workmanship and other characteristics.

E. Submit supporting data and specifications showing compliance with specifications.

F. Submit samples with shop drawings when both are required.

G. Maintain at site one approved sample properly identified of each product of material for which samples are required.

1.8 MATERIAL COLORS AND FINISHES

A. Within 15 days after receipt of approval by the Engineer of the list of Subcontractors on the project, secure and supply to the Engineer color cards, finish samples and other information for all items requiring a color or finish selection.

B. Advise Engineer of any deadlines for color or finish selections that may be necessary to insure delivery of materials on schedule.

1.9 RECORD DRAWINGS

A. The Contractor shall provide and maintain in proper order, in good, clean condition, in field office at the project site, one complete set of prints of all drawings.

B. On this set with red pencil or ink, neatly inscribe all changes in work

C. At time of final acceptance and prior to final payment present these corrected prints to the Owner through the Engineer. Note all data and changes on these record drawings in sufficient detail, clarity and provide information necessary for preparation of "as-built" drawings.

1.10 GUARANTEES, WARRANTIES AND CERTIFICATES

A. Submit all guarantees, warranties and certificates to the Engineer prior to final payment.

B. Refer to section 01 70 00.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Submit all operating and maintenance instructions to the Engineer prior to final payment.

B. Refer to Section 01 70 00.

END OF SECTION

SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 PROCEDURES

A. Give all notices and comply in full with all applicable standards, requirements, rules, regulations, code statutes, ordinances, etc. of municipal, county and state governments. Owner's and Contractor's insurance companies, local utilities and labor regulations relating to the performance of the work, the protection of adjacent property and the maintenance of passage ways, guard fences or other protective facilities.

B. Work shall comply with the General Orders on Safety in Construction as issued by the Department of Industry, Labor and Human Relations.

C. Exercise precaution at all times for the protection of persons (including employees) and property. Observe the safety provisions of applicable laws, building and construction codes. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America.

D. Promptly notify the Owner and Engineer of any variances of the drawings or specifications with that of any Federal, State or local law, code, rule or regulations. Upon such notification, the Engineer will arrange correction of variance to comply with applicable law, code, rule or regulation at no additional cost to the Contractor.

E. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations he shall assume full responsibility therefore and shall bear all costs attributable thereto.

F. Refer to sections of the work for referenced codes, standards, tests, etc. applicable to the work.

1.2 TAXES

A. Pay all sales, consumer, use and other similar taxes required by law, including but not limited to the unemployment, FICA, State, Federal and local municipality sales, excise and manufacturer's taxes. If the tax laws are subsequently amended by legislation during the life of the contract, the contract will be adjusted to reflect the net change caused by such amendment.

1.3 PERMITS, FEES AND LICENSES

A. Secure and pay all fees for all permits, governmental and utility approvals and licenses necessary for the proper execution and completion of the work, which are applicable at the time the bids are received.

B. Each Contractor shall furnish Owner with copies of all required permits and certificates of inspection applicable to his work.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITES AND CONTROLS

PART 1 - GENERAL

1.1 MAINTENANCE OF EXISTING SERVICE

A. The building will be continuously occupied during the construction period. Special efforts shall be made to avoid interference with building functions. Consult with the Owner to turning off services so that Owner can advise as to most suitable time for the necessary interruptions. All such work and interruptions to services shall be performed at times which are approved by the Owner.

1.2 TEMPORARY FACILITIES

A. TEMPORARY FACILITIES
   1. Project Sign: No individual advertising signs, plaques or credits, temporary or permanent, will be permitted on the building or premises except the name of the Contractor on his office or material shed.
   2. Explosives: Use of explosives for any purpose is prohibited.
   3. First Aid: The Contractor shall provide temporary first aid facilities on the site.

1.3 CONTROLS

A. PARKING
   1. No parking facilities will be provided for employees of any Contractor on site.
   2. Parking will be made available at no cost to contractors on city streets.
   3. Do not obstruct existing service drives and parking lots with equipment, materials or vehicles except as specifically noted in this section. Keep accessible for Owner's use at all times.

B. SECURITY
   1. The Contractor shall provide for the security of materials and equipment stored at the site. Material and equipment shall not be stored in areas which the Owner continues to use. The Contractor may store equipment and materials in areas in which he is working.

C. SPECIAL CONTROLS
   1. Noise Control: The Contractor shall confine his hours of operations to those required by State, County and City laws and ordinances. Noise levels shall be held to a minimum considering the nature of the work.
   2. Restroom Control: The Contractor shall be permitted to responsibly use Owner’s onsite toilet facilities. This privilege may be withheld if the facilities are left excessively soiled or abused in any way.
   3. Power Control: Onsite electrical service may be used by contractors at no charge. Any necessary alternations of building’s electrical systems for contractor’s temporary use will be at the expense of the contractor and Retain or delete this article in all Sections of Project Manual.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. All materials, equipment and other items incorporated in the work of this project must be new and both materials and workmanship of best grade of their respective kinds.

B. To assure ready availability of materials, parts or components for repair, replacement or future expansion purposes, all materials, equipment and related components must be obtained from sources which maintain a regular, domestic stock.

1.2 LABOR AND MATERIALS

A. Material and equipment incorporated into the work shall conform to applicable specifications and standards, and comply with size, make, type and quality specified.

B. Manufactured and Fabricated Products:

C. Design, fabricate and assemble in accordance with the best engineering and shop practices.

D. Manufacturer like parts of duplicate units to standard sizes and gauges to be interchangeable.

E. Two or more items of the same kind by the same manufacturer shall be identical.

F. Products shall be suitable for service conditions.

G. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

H. Unless otherwise provided in the contract documents, provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation and other facilities and services necessary for the proper execution and completion of the work, whether temporary or permanent and whether or not incorporated or to be incorporated in the work.

I. At all times enforce strict discipline and good order among your employees and do not employ on the work any unfit person or anyone not skilled in the task assigned to him.

1.3 REUSE OF EXISTING MATERIAL

A. Except as specifically indicated or specified, materials removed shall not be used in the completed work.

B. For material specifically indicated or specified to be reused in the work use special care in removal, handling, storage and reinstallation. Arrange transportation, storage and handling of products for such work.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When contract documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation including two copies to the Engineer prior to installation.

B. Maintain one set of complete instructions at the job site during installation and until completion.

C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer or Owner for further instructions.

D. Do not proceed with work without clear instructions.

1.5 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.

B. Provide protection against damage for all materials during delivery to and storage at the site.

C. Handling of all materials and equipment shall be such as will prevent damage to such materials and/or equipment.

D. Deliver products in undamaged condition, in manufacturer's original containers or packaging with identifying labels intact and legible.

E. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

F. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products by packaging.

G. Replace or repair to the satisfaction of the Owner all items damaged because of failure of the Contractor to properly protect during transportation and handling whether on or off the project site.

1.6 STORAGE AND PROTECTION

A. Protect all materials, work and equipment against damage at all times.

B. Store products in accordance with manufacturer's instructions with seals and labels intact and legible.

C. Store products subject to damage by the elements in weathertight enclosures.

D. Maintain temperatures and humidity within the ranges required by manufacturer's instructions.

E. Store fabricated products above the ground on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.

G. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from weather or subsequent construction operations. Remove when no longer needed.

1.7 PRODUCT OPTIONS

A. For products specified only by reference standard, select any product meeting that standard.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the specifications.

C. For products specified by naming only one product and manufacturer, there is no option.

D. After the list of major products proposed to be used has been submitted, should a listed product be discontinued, revised or changed from what is specified, the Contractor shall submit a separate request for each product supported with complete data, with drawings and samples as appropriate including: Comparison of qualities of the proposed substitutions with that specified; changes required in other elements of the work because of the substitution; effect on the schedule construction; cost data comparing the proposed substitution with the product specified; any required license fees or royalties or availability of maintenance service and source of replacement materials. The Owner shall be the judge of the acceptability of the proposed substitution.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 CLEANING UP

A. The Contractor shall keep premises free of accumulation of surplus materials and rubbish resulting from construction operations. Remove all rubbish from premises; no burning of rubbish on premises will be allowed.

B. Accomplish rubbish removal daily. Keep interior of building free at all times of unattended combustible rubbish.

C. Remove all tools, equipment, scaffolding and temporary facilities immediately when no longer required for execution of the work.

D. The Contractor shall "broom-clean" in the area of work as construction progresses to eliminate dirt and trash accumulation and maintain proper project cleanliness.

E. Immediately prior to final inspection the Contractor shall additionally:
   1. Clean all surfaces to condition acceptable for immediate occupancy by the Owner.
   2. Remove all marks, stains, fingerprints, paint droppings and other foreign matter from all finished items.
   3. Clean and polish all hardware.

F. The Contractor shall leave the work clean in all respects, ready for use and occupancy by the Owner without additional work.

1.2 GUARANTEES, BONDS AND AFFIDAVITS

A. Submit all written guarantees, bond and affidavits required to the Owner through the Engineer prior to final payment.

B. Guarantees shall extend the full period of the required guarantee period after:
   1. Replacement of work found defective during guarantee period at any time after substantial completion.
   2. Repair of inoperative items or adjustments to proper working condition of items not operating properly at time of inspection at substantial completion.
   3. Completion of work not completed at time of substantial completion.

C. Items of equipment or material bearing a guarantee of the manufacturer or supplier longer than required by these specifications shall not serve to release the manufacturer or supplier from their obligation to repair or replace such items within the limits of their guarantee after expiration of guarantees required by these specifications.

1.3 RECORD DRAWINGS

A. Required prior to final payment. Refer to Section 01 33 00. Submit to Owner through Engineer.

1.4 SHOP DRAWINGS

A. Refer to Section 01 33 00.

1.5 INSPECTIONS

A. SUBSTANTIAL COMPLETION
   1. Work of the Contractor shall be substantially complete and inspection requested in writing to the Engineer.

B. FINAL COMPLETION
   1. All work shall be complete when written notice requesting final inspection is submitted to the Engineer. At time scheduled for final inspection by the Engineer, the Contractor shall provide all required submittals to the Owner through the Engineer.

1.6 TESTS

A. Complete all tests required to prove actual operating performance of materials and systems incorporated into the project.

B. Submit reports of all findings to the A/E prior to final payment.

1.7 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Prior to final payment submit to the Owner through the Engineer, maintenance information for all systems provided under the contract.

B. Refer to sections of technical specifications for special requirements affecting the submission of all instructions and other information required.

C. Contractor to provide training to select Sheriff's Office and DIO staff.

1.8 CERTIFICATE OF COMPLIANCE

A. Refer to Section 01 33 00.

END OF SECTION

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.1 DEMOLITION AND SYSTEM REPLACEMENTS

A. Demolition and system replacements may be done during normal business hours when the following rules and regulations are adhered to. All weekly work schedules must be submitted to and approved by Sedgwick County Project Services.

B. Any access required to secured area of the Work Release Center shall be arranged with Sedgwick County Project Services.

C. All existing CCTV equipment to be removed and replaced shall be turned over to the Owner, including stainless steel camera housings and equipment.

1.2 MATERIAL DELIVERIES

A. All deliveries must be made to the Contractors job trailer.

B. Deliveries of major equipment must be scheduled with the Owner's Representative.

C. Delivery and work vehicles are not allowed to park in delivery areas or outside ramps unless prior approval is given by Sedgwick County Project Services.

D. Any weekend deliveries must be scheduled with Sedgwick County Project Services three (3) business days prior to delivery.

1.3 CONSTRUCTION/DEMOLTION MATERIAL REMOVAL

A. The Contractor/subcontractor must make arrangements with Sedgwick County Project Services to obtain a dumpster for the discarded materials. The dumpster must not interfere with the operation of the loading dock's or Sedgwick County Project Services access to building. All dumpster arrangements must meet with the approval of the building's Chief Engineer prior to arrival.

1.4 CONTRACTOR MOBILIZATION

A. The contractor shall comply with the requirements of Sedgwick County Project Services procedures for mobilization of workers. Coordinate with Owner all requirements for pre-screening of workers, inventorying of tools, access to site, and other operational/procedural requirements of working in an occupied facility.

1.5 BUILDING PROTECTION

A. Any hallways in common areas must be protected to prevent damage in the following manner:
   1. Carpet runners (supplied by Contractor) must be used.
   2. Wall corners, doors, and wallpaper must be protected when moving large objects through the area.
   3. Masonite must be put down on all heavily-used areas to protect the floors.
   4. Extension cords must be secured when run across any traffic areas.

B. When high dust occurs as a result of work, dust shields must be installed by the Contractor.

C. The Contractor is responsible for daily/nightly clean-up or the work space and common areas.

D. Hallways must remain free of obstacles, and fire exits must remain clear.

1.6 CONTRACTORS TOOLS

A. Contractor shall take notice that building is a jail facility and is occupied during construction. All Contractor tools must remain on person in all security sensitive locations of the building. No tools shall be left unattended. The Contractor must inventory tools at the end of each day and be locked in a secure room to be determined by the Owner. Any missing tools must immediately report to the Owner.

1.7 BUILDING EMERGENCIES

A. All contractors must comply with the building's Fire & Life Safety System Evacuation Program.

1.8 CONDUCT

A. Professional conduct is required at all times while on the premises.

B. Personal radios are not allowed.

C. The Sedgwick County Project Services reserves the right to deny access to the building to a contractor due to disregard of Rules and Regulations.

1.9 NO SMOKING POLICY

A. This building is a "No Smoking" facility.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

A. Not used.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. The Contractor shall be responsible for all cutting, patching, or fitting of the work as required to make its several parts fit together as shown or reasonably implied by the drawings or specifications to complete the Work or to:
   1. Uncover portions of the work to provide for installation of ill-timed work;
   2. Remove and replace defective work;
   3. Remove and replace work not conforming to requirements of contract documents;
   4. Remove samples of installed work as specified for testing;
   5. Install specified work in existing construction.

B. Do not endanger any installed work by cutting or altering work or any part of it.

C. Do not cut or alter existing precast plank or topping without written consent of the Engineer.

1.2 SUBMITTALS

A. Prior to cutting which may affect structural safety of project, submit written notice to Engineer requesting consent to proceed with cutting including:
   1. Description of affected work;
   2. Necessity for cutting;
   3. Affect on other work or structural integrity of project;
   4. Description of proposed work, indicating scope of cutting and patching;
   5. Subcontractor to execute work, products proposed to be used and extent of refinishing
   6. Alternatives to cutting and patching.

B. Prior to cutting and patching done on instruction of Engineer, submit cost estimate.

C. Submit written notice to Engineer designating time work will be uncovered to provide for observation.

1.3 PAYMENT FOR COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Engineer, shall be paid by party responsible for ill-timed, rejected or non-conforming work.

B. Work done on written instructions of Engineer, other than defective or non-conforming work, shall be paid by Owner.

1.4 MATERIALS

A. Comply with specifications and standards for each specific product involved.

1.5 INSPECTION

A. Inspect existing conditions of project including elements subject to damage or to movement during cutting and patching.

B. After uncovering work inspect conditions affecting installation of products or performance of work.

C. Report questionable conditions to Engineer in writing. Do not proceed with work until Engineer has provided further instructions.

1.6 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of project from damage.

C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work and maintain all areas free from water.

1.7 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

C. Restore work which has been cut or removed. Install new products to provide completed work in accord with requirements of contract documents.

D. Fit work tightly to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Firestop wall or floor fire separation penetrations.

E. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

F. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish entire unit.

G. Install flashing or caulk to provide weathertight seal where required.

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 73 00 "Execution" for cutting and patching procedures.
3. Section 01 32 33 "Photographic Documentation." for survey of existing conditions.
4. Section 01 50 00 "Temporary Facilities and Controls." for site use.
5. Section 01 50 00 "Temporary Facilities and Controls." for temporary enclosures, dust control, heating, and cooling.
6. Section 01 74 19 "Construction Waste Management and Disposal." for disposal of demolished items.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Retain "Proposed Protection Measures" Paragraph below if selective demolition operations occur adjacent to occupied spaces and an informational submittal is required.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Predemolition Photographs or Video: Submit before Work begins.

F. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

C. .

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

   1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 01 10 00 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

F. Carpet: Remove carpet/carpet tiles, adhesive, mats etc to subflooring.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Existing Items to Be Removed: as indicated on the drawings.

B. Existing Items to Be Removed and Salvaged: as indicated on the drawings.

C. Existing Items to Be Removed and Reinstalled: as indicated on the drawings.

D. Existing Items to Remain: as indicated on the drawings.

END OF SECTION 02 41 19

SECTION 03 30 00
CONCRETE

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Application provisions of Division 01 shall govern work of this Section.

1.2 Where not modified or exceeded by these specifications, or by the drawings, the "Specifications for Structural Concrete for Buildings" ACI 301-10, current edition shall be the specification for all concrete construction for this project, as if hereto attached or herein repeated. ACI and CRSI standards and recommendations included in ACI 301-10 shall likewise become minimum construction standards for this specification.

1.3 Contractor shall consult this document and its reference documents and become thoroughly familiar with their contents. He shall further procure the following documents and keep at least one copy of each on the work and available to the Architect during all concrete operations:

ACI 301-96	Specifications for Structural Concrete
C31-69-80	Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field.
C94-81	Specifications for Ready-Mixed Concrete
C143-78	Method of Test for Slump of Portland Cement Concrete
C173-78	Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method
ACI 318-83	Building Code Requirements for Reinforced Concrete
ACI 347-78-84	Recommended Practice for Concrete Form Work
ACI 306-R88	Recommended Practice for Cold Weather Concreting
ACI 305R-91	Recommended Practice for Hot Weather Concreting
ACI 304R-89	Recommended Practice for Measuring, Mixing and Placing Concrete
CRSI 78	Recommended Practice for Placing Reinforcing Bars

1.4 All poured-in-place concrete including but not limited to footings, grade beams, floor slabs, toppings, stairs, sidewalks, retaining walls, curbs, light pole bases, concrete parking surfaces and drives.

1.5 All exterior concrete including parking surface and sidewalks shall be poured with a max. slump of 3" and compaction for base under concrete shall be in accordance with the specifications; compaction shall be certified by the Testing Laboratory.

1.6 Where specified, all sidewalks (4" thick) shall be reinforced with 6x6, #8/#8, W2.1 x W2.1 W.W.F. and all concrete parking and drives (6" thick) shall be reinforced with 6x6, #4/#4, W4.0 x W4.0 W.W.F.

1.7 This section specifies cast-in-place concrete, including formwork, reinforcement concrete, materials, mix design, placement procedures and finishes.

1.8 SUBMITTALS

A. Product data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mic, include alternate mix design when characteristics of material, project conditions, assembly, and support of formwork. Design and engineering of formwork are Contractors responsibility.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

D. Material Test Reports: From a qualified testing agency indicating and interrupting test results for compliance indicated, based on comprehensive testing of current materials.

E. Material Certificates: Signed by manufacture's certifying that each of the following items complies with requirements:
1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Fiber reinforcement
5. Ad mixtures
6. Curing materials
7. Bonding agents
8. Adhesives.
9. Epoxy filler strips
10. Repair materials

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufactures Qualifications:
1. A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

2. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

1.10 WORK INCLUDED

A. This section of the specifications shall include the furnishing of all labor and materials as required in connection with the completion of the following items of concrete - plain and reinforced concrete, or items of a cement nature throughout the building including the following:
1. Furnish and set all lumber and plywood as required concerning the forming of the concrete work.

2. Place all bar, steel mesh, rebar, and like reinforcement for all reinforced concrete work.

3. All concrete as specified herein.

4. Footings, foundations and floors.

5. Cement floor finish and sealer as required.

6. The setting in the concrete of all inserts, hangers, anchors, anchor bolts, ties, rods, etc., as required by the drawings or later sections of these specifications.

7. All labor and materials of a plain or reinforced concrete nature required by the drawings or later sections of these specifications or for the correct and substantial installation of the work included herein.

8. Sidewalks, slabs and curbs, as indicated.

9. All joints materials, curing materials and installation of vapor barriers.

10. Expansion joints and tooled joints as required.

11. Shop drawings, inspections and tests.

1.11 MATERIALS INSTALLED IN THIS DIVISION AND/OR FURNISHED BY OTHERS

A. This Contractor shall build into concrete work the following materials, which are furnished by other trades and shall embed and secure same as required.

1. Concrete inserts, hangers, anchors, sleeves for all piping and ductwork as required for all trades.

2. Anchor bolts, plates, dovetail anchor slots, reglets, etc.

3. Loose lintels bearing on concrete work.

4. Door and window frames, bucks, anchors, occurring in concrete work.

1.12 COOPERATION WITH OTHER CONTRACTORS

A. This Contractor shall cooperate with all other contractors engaged in work in the building to the end that proper unity of action will facilitate the orderly progress of the work. Shop drawings or other data that may be provided by or for this Contractor for use in the installation of his work shall be given to those contractors who required the information contained therein.

PART 2 - MATERIALS

2.1 Portland Cement: Portland Cement shall conform to the "Standard Specifications for Portland Cement" (ASTM Serial Designation C150) and shall be Type 1, 1a or 111. High early strength concrete may be used only upon approval of the Architect.

2.2 Aggregate: Aggregate shall conform to ASTM Serial Specification C33-90.

A. Fine Aggregate:

Fine aggregate shall consist of sand having clean, hard, durable uncoated grains, free from deleterious substances and shall range in size from fine to coarse within the following percentages by weight:

Passing No.....4 sleeve.....95-100 Percent
Passing No..... 8 sleeve..... 80-100 Percent
Passing No..... 16 sleeve.....50-85 Percent
Passing No..... 30 sleeve.....25-60 Percent
Passing No..... 50 sleeve.....10-30 Percent
Passing No..... 100 sleeve..... 2-10 Percent

Volume removed by sedimentation.... not more than 3 percent. Not more than 35 percent shall pass a standard size sieve and be retained on the next smaller sieve.

B. Coarse Aggregate:

Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard, durable, uncoated particles, free from deleterious matter, meeting graduation requirements of ASTM C33, No. 67. After acceptance of a grading, a variation in the amount passing any sieve size of more than 10 percent of the total will not be permitted. The grading shall be within the following percentages by weight:

Passing a 1" sieve.....100 Percent
Passing a 3/4" sieve.....90-100 Percent
Passing a No. 4 sieve .....0-10 Percent
Passing a No. 8 sieve .....0-5 Percent

The maximum sized aggregate shall be not larger than one-fifth (1/5) of the narrowest dimension between form of the member for which the concrete is to be used nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars, and forms as shown on the drawings.

C. Soundness:

The fine and coarse aggregate when subjected to five alternations of the sodium sulfate soundness test (ASTM Designation C88-46T) shall not show an average weighted loss of more than 10 percent for the fine aggregate and 13 percent for the coarse aggregate unless evidence satisfactory to the Architect is furnished that concrete of comparable proportions in which similar materials from the same sources were used has been exposed to natural weathering for a period of at least 5 years without appreciable disintegration.

2.3 Mixing Water: Mixing water shall be clean and free from oil, acid and injurious amounts of vegetable matter, organic materials, alkalis, salts, or other substances that may be deleterious to concrete or steel.

2.4 Expansion Joint Filler: Expansion joint filler shall be premoulded and composed of fiber board impregnated with asphalt similar and equal to "Flexcell" as manufactured by the Celotex Company. All joint filler material shall be the thickness of the slab or joint and unless otherwise indicated shall be one-half (1/2) inch thick.

2.5 Metal Reinforcement:

A. Metal reinforcement shall conform to the requirements of the "Standard Specifications for Billet-Steel Bars Concrete Reinforcement." (Serial Designation ASTM A-615-82 of the American Society for Testing Materials.)

B. Welded wire fabric for concrete reinforcement shall conform to the requirements of the "Standard Specifications for welded steel wire fabric for concrete reinforced" shall conform to ASTM A185-79.

2.6 Reinforcing Bar Supports:

All reinforcing shall be properly and adequately supported at the design heights indicated on the Structural Plans by the use of chair supports. Chair supports with galvanized legs shall be equal to bar supports manufactured by the Dayton Sure Grip & Shore Co., Miamiburgh, Ohio.

PART 3 - EXECUTION

3.1 Concrete when deposited in hot weather shall be in strict accordance with ACI 305R-91 "Recommended Practice for Hot Weather Concrete."

3.2 Concrete when deposited in cold weather shall be handled in strict accordance with ACI 306R-88 "Recommended Practice for Cold Weather Concreting."

3.3 FORMS

A. General: The foundation is designed for a combination of trench and formed footings or walls.

1. Forms shall conform to shape, lines and dimensions of the members as shown on the Plans. They shall be properly spaced or tied together to maintain position and shape and insure safety to workmen and passerby. Forms shall be made tight to prevent leakage of mortar.

2. Formwork for concrete shall be designed and constructed in strict accordance with ACI 347 Recommended Practice for Concrete Formwork".

3. If adequate foundations for shores cannot be secured, trussed supports of adequate design shall be provided.

3.4 Exposed Concrete:

A. Unlined forms shall be used for the face of all exposed concrete walls and all other exposed surfaces where indicated on the Drawings. All forms shall be built in place except that panel forms may be used where a single panel will form an entire area from one reveal to another. The use of panel forms will not be permitted where the joints between adjacent panels must be made on flat surfaces or in any other conspicuous locations.

B. The contact surface of all unlined forms shall be constructed of 5/8" or 3/4" five-ply Douglas Fir structural plywood of concrete form grade according to Bureau of Standards Commercial Standards CS45-42. All concrete form plywood shall be so designed by grade marking each panel. Full-sized sheets of plywood must be used except where smaller pieces will cover an entire area. The edges of all plywood sheets shall be straightened on the bench to insure close-fitting, tight joints.

C. When the outside form is erected and reinforcement is in place and before the inside form is erected, the Architect shall be notified and the inside form shall not be placed until

work already done is approved. Open joints, which would permit leakage of grout, shall be sufficient cause for rejection of forms.

D. If, in the opinion of the Architect, pointing of an occasional slightly open joint will prevent leakage, then such pointing shall be done using a material approved by the Architect. Pointing shall be carefully done and there shall be no trace of the pointing mixture on the surfaces of the sheathing.

3.5 REINFORCEMENT

A. Reinforcement shall be detailed, fabricated and placed in strict accordance with SP66-94 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".

B. Cleaning:

Metal reinforcement before placed shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be reinspected and when necessary, cleaned.

C. Bending and Straightening:

1. Reinforcement shall be carefully formed to the dimensions indicated on the Plans. Cold bends shall be made around a pin having a diameter of six or more times the least dimensions of the reinforcement bars.

2. Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bands not shown on the Plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Architect.

3.6 Placing:

A. Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 16 gauge or suitable clips of intersections and shall be supported in a manner that will keep all metal away from the exposed surface of the wall. Structural concrete reinforcement shall be adequately secured in position by concrete or metal chairs and spacers. Nails shall not be driven into the outside forms to support reinforcement not shall any other device for this purpose come in contact with the outside form except that wood strips shall be inserted between the reinforcement and the forms at intervals to maintain the required clear distance between the reinforcement and the inside and outside surfaces of the concrete.

B. The strips shall be pulled up and removed from the wall as the level of the concrete rises. The minimum clear distance between any bar and the weather side of all exterior walls shall not be less than two (2") inches. At all, wall surfaces not exposed to the weather a minimum of one (1") inch of concrete cover over all steel shall be provided.

3.7 Concrete Protection for Reinforcement:

A. Other metal reinforcement shall be protected by the thickness of concrete indicated on the Plans. Where not otherwise shown, the thickness over the reinforcement shall be as follows:

1. Where concrete is deposited against ground without the use of forms, not less than three inches (3").

2. Where concrete is exposed to the weather, or exposed to the ground but is placed in forms, not less than two inches (2") for bars #6 through #18 and one and one half inches (1-1/2") for bars #5 and smaller.

3. In slabs and walls not exposed to the ground or the weather, not less than 3/4".

4. In beams, girders and columns not exposed to the ground or to the weather, not less than 1-1/2".

5. In all cases the thickness of concrete over the reinforcement shall be at least equal to the diameter of round bars and one and one-half times the side dimension of square bars.

3.8 Splicing:

A. Wherever it is necessary to splice reinforcement otherwise than as shown on the Plans, the character of the splice shall be decided by the Architect on the basis of allowable bond stress and the stress in the reinforcement at the splice. Splicing shall not be made at points of maximum stress nor shall adjacent bars be spliced at the same point.

B. All bars shall be lapped at least 30 bar diameters or 24" minimum unless otherwise noted at all corners and at abrupt changes in directions of walls.

C. In slabs, beams and girders, splices of reinforcement at points of maximum stress shall generally be avoided. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear.

3.9 PROPORTIONING AND STRENGTH REQUIREMENTS

A. Measuring Ingredients:

1. All measurements of fine and coarse aggregates shall be made separately by weight. Proportioning aggregates for fractional sacks of cement will not be permitted unless the cement is weighed for each batch. Weighing equipment shall be arranged to permit making compensation for changes in the weight of moisture contained in the aggregates. Weighing equipment shall meet the approval of the Architect and shall be accurate within one percent of the net load being weighed.

2. A satisfactory auxiliary device shall be used in connection with the scale beam to indicate or register at least the last 100 lbs. of each of the aggregates required for the batch.

3. One gallon of water shall be considered as weighing 8.33 lbs.

4. Portland Cement in standard unopened cloth or paper sacks as packed by the manufacturer may be considered as weighing 94 lbs. per sack. Batches shall be proportioned that only full bags of cement are required for a single batch.

3.10 Strength Requirements:

A. All concrete shall have a minimum compressive strength of 3,000 lbs. per square inch at twenty-eight (28) days. Refer to the Structural Notes on the Drawings for additional strength requirements.

3.11 Water-Cement Ratio:

A. The proportioning of materials shall be based on the requirements for a plastic and workable mix with the use of not less than 5-1/2 sacks of cement per cubic yard and no more water than is necessary to gain desired strength, expressed in terms of the quantity of cement. The water in the aggregate must be included in the quantity specified and subtracted from the amount added to the mixture. It shall be measured by methods satisfactory to the Architect which will give results within one (1) pound for each one hundred (100) pounds of aggregate.

3.12 Proportioning and Consistency:

A. The proportions of aggregate to cement shall produce concrete that can be thoroughly compacted.

B. The combined aggregate shall be of such composition of sizes that when separated by the No. 4 standard sieve, the weight retained on the sieve shall be not less than one-half (1/2) nor more than two-thirds (2/3) of the total based on dry materials, except where adjustment is necessary in the opinion of the Architect for casting in special details. In all cases, the regular mix can be used for casting details, except where detail is intricate it may be necessary to reduce the amount of coarse aggregate.

3.13 Quality Control:

Determination of Maximum Water Content:

The strength quality of the concrete proposed for use shall be established by tests made in advance of the beginning of operations using consistencies suitable for the work meeting the requirements of these specifications. Trial design batches and testing shall be the responsibility of the Contractor. Certified copies of all tests and proportions used therein shall be furnished to the Architect for approval. Specimens shall be made and cured in accordance with ASTM Standard C192-49. A curve representing the relation between the water content and the average 28-day compressive strength shall be established for a range of values including the compressive strength specified herein. The curves shall be established by at least three (3) points, each point representing average values from at least 4 test specimens. The maximum allowable water content for the concrete to be used in the work shall be as determined from this curve and shall correspond to a strength fifteen (15) percent greater than specified. No substitutions shall be made in the materials used in the work without additional tests in accordance herewith to show that the quality of the concrete is satisfactory.

3.14 CONCRETE MIXING PLANT

A. Job mixed concrete will not be allowed. Concrete shall be batched at a central plant and conveyed to the job in mixing trucks. Ready-mix concrete shall conform to ASTM Tentative Specifications C94. It shall be the responsibility of the Contractor to maintain a proper and uniform air content as determined by test at the jobsite and variations in air content beyond the specified limits for two consecutive tests shall be sufficient cause for rejection of all concrete until evidence of adequate corrective measures has been furnished the Architect.

3.15 DEPOSITING CONCRETE

A. Cleaning Equipment:
Before beginning a run of concrete hardened concrete and foreign materials shall be removed from the inner surfaces of the mixing and conveying equipment. All conveyances, buggies, or barrows shall be kept clean during the placing of the concrete.

B. Transportation:
Concrete shall be handled from the mixer to the place of final deposit in cars, buggies or conveyers. The concrete shall not be spouted nor delivered by spout or trough from the hoists, not dumped into carts with a free fall from the mixer of more than three feet. Every possible precaution shall be kept on temporary runways built over the floor system and runway supports shall not bear upon reinforcement steel or fresh concrete.

C. Time of Placing:
Concrete shall not be placed until all reinforcement is secured and properly fastened in its correct position, nor until the trenches have been inspected and approved by the Architect, nor until all sleeves, hangers, pipers, conduits, bolts, wires and any other fixtures required to be embedded therein have been placed and anchored by the Contractor not until the trenches and reinforcement have been cleaned. Concrete shall not be placed at any time except under the direct supervision of the Architect nor outside of regular working hours unless the Architect is notified at least 4 hours in advance and the Architect's superintendent or inspector is on the job.

D. Preparation for Placing:
1. Water shall be removed for excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms, unless lines, shall be oiled or except in freezing weather, wet with water in advance of concrete placement to prevent seepage of cement grout from the mix.

2. Reinforcement shall be secured in position, inspected and approved by the Architect before placing concrete. All concrete placed in violation of this provision shall be rejected and removed. Runways or other means approved by the Architect shall be provided for wheeled equipment to convey concrete to points of deposit. Equipment used to deposit concrete shall not be wheeled over reinforcement not shall runways be supported on reinforcement.

E. Placing:
1. Special care must be exercised to prevent segregation of the concrete and to prevent splashing the trench or reinforcement with concrete and any such splashes or accumulations of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds.

2. Concrete shall be handled from mixer or transport vehicle to place of final deposit in a continuous manner and as rapidly a practicable until the given unit of operation, approved by the Architect is completed. Concrete that has attained its initial set or has contained its water content for more than 1-1/2 hours shall not be used in the work. Reinforcement shall not be splashed with concrete in advance of placing operation.

3. Concrete shall be deposited in the trenches in uniform layers not exceeding 24" in depth and as nearly as practicable in final position to avoid rehandling. Immediately after depositing, concrete shall be compacted by thoroughly agitating in a manner approved by the Architect, to force out air pockets, work the mixture into corners and around reinforcement and inserts, and prevent formation of voids.

3.16 DEPOSITING AGAINST OTHER CONCRETE

A. Before depositing new concrete in the walls on or against concrete that has hardened, the forms shall be retightened, the surface of the hardened concrete shall be roughened, as required, thoroughly cleaned of foreign matter and laitance, and moistened with water. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond. To insure sufficient mortar at the juncture of the hardened and the newly deposited concrete, a layer of Portland Cement-sand mortar one inch to two inches thick shall be deposited against the hardened concrete into which the regular mix concrete shall be deposited immediately. The cement-sand mortar shall be of the same proportions as the regular concrete mix except that the coarse aggregate is omitted.

3.17 CONCRETE FLOOR FINISH

A. Concrete slabs shall be finished as hereinafter described. The dusting of wearing surfaces with dry materials WILL NOT be permitted. In preparation for finishing, floor slabs shall be struck off true to the required level at or below the elevation or grade of the finished floors as shown on the drawings. Floors shall be left with a tolerance (Class "B") of 1/4" in 10 feet except where drains occur or a definite slope is given in which case the floors shall be finished to the lines and grades shown on the drawings or as directed by the Architect.

B. Monolithic Finish: Tamping the concrete with special tools to force the coarse aggregate away from the surface shall finish floors shown on the drawings to receive a monolithic finish. Then screeding and floating with straight edges to bring the surface to require finish level shown on the drawings. While the concrete is still green but sufficiently hardened to bear a man's weight without imprinting, it shall be wood floated to a true even plane with not coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand-trowelled to produce a surface free from trowel marks.

C. Wood or Cork Float Finish: Floors indicated on the drawing to receive wood or cork float or broomed finish shall be finished by tamping the concrete with special tools to force aggregate away from the surface, then screeding with straight edges to bring surface to required line as shown on the drawings. While the concrete is still green but hardened sufficiently to bear the cement finisher's weight, the surface shall be floated with a wood or cork float to a true uniform plane with no coarse aggregate visible.

D. Power Machine Finishing: In lieu of hand finishing, the contractor may use a power machine for finishing concrete floors in accordance with the direction of the machine manufacturer. The preparation of concrete surfaces for finishing by machine shall in general be as herein before required for hand finishing.

3.18 PROTECTION AND CURING

A. Protection Against Moisture Loss:
Immediately after placing or finishing concrete surfaces not covered by forms shall be protected from loss of surface moisture for not less than 7 days where a normal Portland cement has been used or 3 days where a high-early strength Portland cement has been used by covering with Kraft paper mats. Kraft paper shall be sealed. Protect concrete from too rapid drying or freezing for 6 days.

B. Curing Compound: Membrane curing compound shall comply with ASTM C-309, Type I, Class A and B and AASHTO M-148, Type 1 and/or Type I-D. Curing compound shall be equal to "Conspec Cureseal" as manufactured by Conspec Marketing and Manufacturing Co., Inc., 636 South 66th Terrace, Kansas City, Kansas (800) 348-7351 or the approved equal. Materials shall be applied to all newly finished concrete floors and walks. **Special Curing requirements shall be necessary in areas which receive resinous flooring. All curing compounds shall be compatible with the concrete finish specified.**

C. Patching:
Any concrete which is not formed as shown on the plans or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the contractor at his expense unless the Architect grants permission to patch the defective area, which shall be done in accordance with the following procedure: Permission to patch any such area shall not be considered a waiver of the Architect's right to required complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface.

D. Cleaning:
1. No cleaning operations shall be undertaken until the walls of the building are entirely completed. Cleaning portions of the walls as the work progresses will not be permitted. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland cement shall be used for all or part of the cement in the grout, as directed by the Architect, to give the color directed. Wet the surface of the concrete and apply the grout, float the surface with a cork float, scouring the wall vigorously. While the grout is still plastic, the surface shall be finished with a sponge rubber float, removing all excess grout. This finishing shall be done at the time when grout will not be pulled from holes or depressions.

2. Next, allow the surface to dry thoroughly, then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible fill or grout remaining after this rubbing. The entire cleaning operation for any areas must be completed the day it is started. No grout shall be left on the wall overnight. After the surfaces to be treated have been grout clean, if any slightly dark spots or streaks remain, they shall be wiped off lightly with a fine abrasive hone without using water, but the rubbing with the hone shall not be sufficient to change the texture of the concrete.

3.19 GROUT

A. Furnish U.S. Grout Corporations' pre-mixed, five star, non-shrink, non-metallic grout or Euo N.S. grout for setting column bases and beam bearing. Grout shall be used in strict accordance with the manufacturer's printed instructions.

3.20 JOINTS IN CONCRETE:

A. Expansion Joints: Provide expansion joints where so indicated on the drawings. Expansion joints shall be continuous of width to extend full thickness of the concrete on plans. In no case shall the reinforcement, corner protection angles, or other fixed metal items embedded in or bonded into concrete, be run continuous through an expansion joint.

B. Concrete walks and ramps shall have expansion joints across the width of the walk or ramp, spaced where indicated on the drawings, but shall not exceed 30' o.c.

C. All concrete slabs on fill that are not made an integral part of the concrete vertical surface they intersect, such as walls, columns, etc., shall be provided with continuous expansion strips at the intersection.

D. Construction Joints:
The unit of operation shall not exceed 80 feet in any horizontal direction unless otherwise approved by the Architect, concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between casting the adjoining units unless this requirement is waived by the Architect. Construction joints, if required, shall be located near the midpoint of spans for slabs, seams, or girders unless a beam intersects a girder at its center in which case the joints in the girder shall be offset a distance equal to twice the width of the beam and provision for shear shall be made by use of inclined reinforcement. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on drawings, no jointing shall be made in footings or foundation work without specific approval of the Architect. Placement of concrete shall be at such rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is place thereto.

E. Control Joints:
Shall be as detailed on the drawings and accurately located to comply with design requirements. Extreme care shall be taken to assure that the break point of reinforcing bars designated to be cut or stopped at control joints coincides exactly with the center line of the joint as shown on the Drawings.

3.21 TEST AND SAMPLES ON CONCRETE

A. Test cylinders - Fieldwork shall be done per "Standard Method of Making and Curing Compression and Flexure Test Specimens in the Field" (ASTM Designation:C31) and as follows:

1. The General Contractor shall include in the Base Bid, all costs with having technician from a certified testing laboratory to be present at the Job Site for each concrete pour (foundations and floor slab), to sample the concrete mix, to prepare the test cylinders, perform filled slump tests, perform air test on the concrete, note temperature of concrete and temperature of the environment.

2. Extent of sampling: One set of 3 test cylinders shall be made for each 50 cu. yards of concrete placed. Location of concrete represented shall be recorded and shown on test cylinders and reports

3. Procedure requirements for ASTM C-31 are as follows:
Place concrete cylinders in 3 equal layers. Rod each layer by 25 strokes for 6" diameter cylinders or 50 strokes for 8" diameter cylinders. Rod shall penetrate each lower layer by only 1/2". Cure and protect cylinders from freezing and/or too rapid drying. Cover each cylinder with plastic. During first 24 hours, store cylinders at location and temperature equal to concrete being tested. After 24

hours, store cylinders under moist conditions and at about 73 degrees F until test breaks are made.

3.22 Laboratory testing of Cylinders:

A. Test cylinders per ASTM C-39 for compressive strength. Test one cylinder at 7 days and one at 28 days, out of each set of specimens. Test third cylinder, when and if requested by the Architect.

B. Copies of each test report shall be submitted within 5 days of date test was made; One to concrete supplier, two to Contractor and one to the Architect.

C. Test Laboratory will be employed by the Contractor.

D. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural light weight concrete, one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

E. Concrete Temperature: ASTM C 1064, one test hourly when air temperature is 40° F and below and when 80° F and above and one test for each composite sample.

3.23 Slump Tests - Fieldwork shall be done per ASTM C-143 and as follows:

A. Extent of sampling: Make slump test from first truckload of each day's pour and at any other time when mix consistency appears to have changed.

B. Maximum to Minimum slumps permitted:

Foundation:	4" to 1"
Slab on grade:	4" to 2"
Other reinforced concrete:	4" to 1"

C. Procedure requirements of ASTM C-143 are as follows:
Obtain metal slump cone of 12" height x 8" diameter bottom and 4" diameter top. Place cone on a smooth, level, moist board. Place concrete in cone in 3 equal layers. Rod each layer by 25 strokes. Rod shall penetrate lower layer by 1/2" and uniformly rod that layer. Strike concrete off top of cone after final rodding. Remove cone so as not to disturb concrete. Measure height difference between top of cone and slumped concrete and compare that measurement with permitted limits specified above. Reject concrete, which exceeds these limits.

3.24 Specimens shall be cured under laboratory conditions except that when in the opinion of the Architect or Engineer, there is a possibility of the surrounding air temperature falling below 40 degrees F., he may require additional specimens to be cured under job conditions.

3.25 The standard age of test shall be 28 days, but 7-day tests may be used provided that the relation between the 2 and 28 days strength of the concrete is established by test for the materials and proportions used.

3.26 If the average strength of the laboratory control cylinders for any portion of the structure falls below the compressive strengths called for on the Plans, the Architect shall have the right to order a change in the proportions or the water content for the remaining portion of the structure. if the average strength of the job cured cylinders falls below the required strength, the Architect shall have the right to require tests in accordance with the "Standard Methods of Securing, Preparing and Flexure Strengths" (ASTM Designation C42) or order load tests to be made on the portions of the building affected.

3.27 When required, the load test shall be at the Contractor's expense, in accordance with Section 202 of the ACI Building Code (ACI 318). In the event the load test indicate that concrete placed does not conform to the drawings and these specifications, measures as prescribed by the Architect shall be taken to correct the deficiency and the cost of all such remedial measures shall be responsibility of the Contractor.

3.28 If the average strength of laboratory cylinders for any portion of the job falls below the minimum allowable strength of 28 days, the Architect reserves the right to order a change in proportions of water or cement content of concrete, or both, for the remaining portions of the job without extra cost to the Owner.

3.29 AIR CONTENT

A. All concrete subjected to freezing and thawing after curing and or required to be watertight shall be air entrained. Total air content as determined in accordance with ASTM C173 shall be:
   1. 5 plus/minus (1) percent for coarse aggregate size No. 467 (1-1/2" max.)
   2. 6 plus or minus (1) percent for coarse aggregate size No. 57 (1" max.) or No. 67 (3/4" max.)
   3. All interior slabs to receive a surface hardener or subject to abrasion shall have a maximum total air content of three percent.

3.30 CONCRETE CURBS AND GUTTERS

A. Form curbs and gutters for areas indicated, to profile detailed. Reinforce as indicated.

B. 3,500 psi air-entrained concrete and deformed intermediate grade billet steel reinforcement bars.

C. Place concrete, reinforcement and cure following requirements of Section 03300 - "Concrete" of this Section.

D. Expansion joints shall be constructed by placing 1/2" premolded asphalt expansion joint material at intervals not exceeding 30 feet along the length of the combined curb and gutter, at all radius point locations.

E. Finish surface by cross-brushing.

F. The cross section of the combined curb and gutter shall be as shown on the Plans.

G. Contraction joints shall be constructed by sawing the curb and gutter at right angles to the curb line at no more than fifteen foot (15') intervals. The saw cuts shall be at least two and one-half inches (2 1/2") in depth and one-fourth inch (1/4") in width. All joints shall be sawed as soon as is practical after the concrete has hardened sufficiently to eliminate tearing and raveling. The maximum allowable time between the placing of the curb and gutter and the sawing of joints shall be twelve (12) hours; however, any procedure which results in premature and uncontrolled crackling shall be revised immediately. The joints shall be filled immediately after sawing with joint sealer meeting the requirements for sealing concrete pavement joints. A nozzle designed so that the joint is filled completely from top to bottom shall be used in filling the joints.

H. When combined curb and gutter adjoins concrete base or concrete pavement, it shall be tied to such base or pavement using essential joint and tie bars. The tie bars shall be two (2) feet and zero (0) inches long and spaced on two (2) feet and six (6) inch centers.

END OF SECTION

SECTION 04 10 00
MORTARS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 01 shall govern work of this Section.

1.2 WORK INCLUDED:

This Contractor shall furnish all labor and materials to complete all masonry mortar work as required by the drawings and/or herein specified.

1.3 USES OF MORTAR**:**

Type "S" Portland -Cement -lime mortar, as herein specified, shall be used for exterior and interior masonry units of all exterior and interior walls. (ASTM C-270 or BIA M1-72.) Type "M" shall be used for masonry below grade and in contact with the Earth.

PART 2 - MATERIALS

2.1 Cementitious Materials:

Shall conform to the appropriate ASTM Standard Specifications, amended to date for the materials as follows:

A. Masonry cement shall be Lehigh Masonry Cement from their plant at Iola, Kansas, or Ash Grove Masonry Cement from their plant at Chanute, Kansas or Atlas Masonry Cement from their plant at Independence, Kansas.

B. This masonry cement shall be an interground mixture of Portland Cement Clinker and Limestone and shall meet the requirements of the ASTM Specifications C91-53, type 11. Expansion shall not be greater than 1% when tested in accordance with ASTM Specifications C0154-49, except that the test bars shall remain in molds for 48 hours prior to test.

C. This Contractor will be allowed the option of using hydrated lime (High Calcium, type S) or quick lime.

D. Quicklime: Standard Specifications for Quick Lime for Structural purposes. (ASTM C-5-26).

E. Hydrated Lime: Tentative Specifications for Hydrated Lime for Masonry purposes (ASTM20).

2.2 Aggregates: Standard Specifications for Aggregate for Masonry Mortar (ASTM C-144).

2.3 Water: Water shall be clean and free of deleterious amounts of acids, alkalies or organic materials.

2.4 Admixtures: Admixtures not mentioned in these specifications shall not be used in mortar without the approval of the Architect.

2.5 Anti-Freeze Compounds: No Anti-Freeze liquid, salts or other substances shall be used in the mortar to lower the freezing point.

2.6 Water Repellant: EUCO INTEGRAL WATERPELLER as manufactured by Euclid Chemical Co., 19218 Redwood Road, Cleveland, Ohio 800-321-7628 or an approved equal shall be included in the mortar for all masonry walls exposed to the weather. Water repellant shall be added to the mix (quantities and methods) in accordance with the manufacturer's recommendations.

2.7 Storage of Materials: Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration and intrusion of foreign matter. Any material having become unsuitable for good construction shall not be used.

PART 3 – EXECUTION

3.1 Measurement of Materials: Method of measuring materials for the mortar shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained during the entire progress of the work. Mortar mixer sized to accommodate full bags of Portland cement and lime. Mixing mortar shall be in compete accord with BIA technical notes 8B.

3.2 Mixing Mortar: Cementitious materials and aggregate shall be mixed with the maximum amount of water consistent with satisfactory workability for a minimum period of 3 minutes in a drum type batch mixer.

3.3 Mixing Grout: Grout shall consist of mortar meeting the applicable specification requirements to which sufficient additional water is added to cause the mixture to flow readily.

3.4 Minimum Aggregate Ratio: The damp loose volume of aggregate in mortar shall be not less than 2-1/4 time nor more than 3-1/2 time the total separate volumes of cementitious materials used.

3.5 MORTAR PROPORTIONS

A. Type "S" and "M" Mortar mix shall be designed in accordance with ASTM C-270 thru a testing laboratory.

END OF SECTION

SECTION 04 20 00
MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 01 shall govern work of this Section.

1.2 WORK INCLUDED

This Contractor shall furnish all labor and materials to complete all masonry work as required by the drawings and/or herein specified, as follows:

A. All concrete block work indicated on the drawings.

B. All required anchors and ties.

C. Beam blocks, lintels, etc.

1.3 DELIVERY, STORAGE & HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, containment's, corrosion, and other causes. If units become wet, do not install until they are in air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 – PRODUCTS

2.1 Concrete Masonry. Block-Lightweight Concrete Masonry units shall conform to the current ASTM C-90 for hollow load bearing grade "A" units. Block shall be Standard Haydite weighing not more than thirty (30) pounds per unit. Either the high pressure Autociave curing system or "lo-Shrink" method to produce material acceptable to the Corps of Engineers Group II standards shall produce all block. Blocks shall be kept dry from point of manufacture until the units have been laid in the walls. Size and locations as shown on the Drawings.

2.2 Masonry ties

A. Truss Type:

1. Masonry wall reinforcement as noted on the plans shall be equal to Dur-O-Wall a Hohmann & Barnard Company Truss design or approved equal truss design and shall be installed in strict accordance with the manufacturer's recommendations at all corners and above openings.

2. Material shall be standard weight 9-gauge cross rods and 9-gauge side rods galvanized with drip. Install truss reinforcement at 16" o/c. vertically.

B. Control and Expansion Joints:
As shown on the drawings. Care should be used to keep these joints free and open. Install water stops.

PART 3 - EXECUTION

3.1 General.

A. No masonry shall be erected when the ambient temperature is below 32 degrees F. on a rising temperature or below 40 degrees F. on a falling temperature or when there is a probability of such conditions existing within 48 hours. Unless special provisions are made for heating the materials and protecting the work, the Architect shall approve such provisions. Masonry work, which has frozen before the mortar has set to the satisfaction of the Architect, shall be removed and replaced.

C. Slush with mortar thoroughly around all windows and doors frames and all other built-in parts. Point with mortar around all windows and windowsills, making this perfectly weathertight. Walls shall be built perfectly true, plumb and straight so as to work in courses to correspond with heights of all openings as indicated on the drawings. Where reinforced concrete floors or slabs extend into walls, brickwork shall be built above such floors or slabs only after the concrete work has been poured. Masonry shall not serve as vertical concrete forms. Pour concrete first and then build masonry.

D. The built surfaces of all walls and piers shall be protected with boards at all times when work is not in progress and shall also be covered with canvas during stormy or damp weather or cold weather and in case of delay. Also properly protect with boards, exposed corners and angles of face and other brick work during construction.

F. Build control joints where shown and as detailed. All such joints shall be completely free of mortar.

G. No masonry or other units having a film of water or frost on their surface shall be laid in the walls. All masonry shall be laid plumb, true to line, with level and accurately spaced courses, and reveals, with corners plumb and true, and with each course breaking joint with the course below. Bond shall be kept plumb throughout.

H. Work required to be built in with the masonry, including anchors, wall plugs, and accessories, shall be built in as the erection progresses. Unless otherwise shown on the drawings or specified, the space around built-in items shall be filled solidly with masonry. Chases and reglets shall be kept clean and free from mortar or other debris.

I. Masonry units shall be culled so that only perfect faces of the units shall be expressed.

3.2 Metal Ties. Metal ties in masonry shall be spaced 2'-0" o/c. horizontally and not over sixteen (16) inches vertically, accurately spaced and fully embedded in mortar.

3.3 Concrete Masonry Units

A. Concrete masonry units shall be erected for interior facing and interior partitions where shown on the drawings. Each course shall be solidly bedded in mortar, with vertical mortar joints lined up in common bond. Vertical joints shall be buttered their entire length. Joints in exposed work shall be approximately 3/8" wide, and be tooled slightly concave.

B. Each course shall be bonded at corners and intersections, and shall be bonded into or anchored to adjacent construction with metal anchors. Where concrete masonry walls butt into concrete walls, provide dovetail slots continuous, in concrete wall and securely anchor masonry wall to same with metal ties spaced not over 16" o/c. vertically. All metal bucks set in concrete masonry unit work shall have back of bucks filled solid with mortar.

3.4 Cutting and Patching. Masonry mechanic shall perform cutting and patching of masonry required by the plans.

3.5 Unfinished Work. Unfinished work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved by the Architect. Before new work is started, all loose mortar shall be removed.

3.6 Protection. Surfaces of masonry not being worked on shall be properly protected at all times during the construction operation. At such times as rain or snow is imminent and the work is discontinued, the tops of exposed masonry walls and similar surfaces shall be covered with a strong waterproof membrane well secured in place.

3.7 This Contractor shall build-up masonry walls to the elevations indicated.

3.8 BOND BEAM
Lay-up and pour bond beams with two number four reinforcing bars at elevations for bearing indicated on the plans. Bond beams shall extend the length of the walls. The bond beams shall be filled with concrete. Bond beams only occur where noted on the plans.

3.9 MORTAR JOINTS
All mortar joints shall be completely filled especially the head joints. Special care shall be taken to ensure head joints are filled completely. Cavities and expansion joints shall be kept clean and free of mortar and/or mortar drippings.

3.10 TOOLING OF MORTAR JOINTS
The tool shall be slightly larger than the masonry joint and shall be of concave profile struck to a weather tight joint.

3.11 CLEANING
When masonry work is complete, proceed with cleaning and caulking. Remove excess mortar and stains using scrapers and brushes.

3.12 After walls have been completed and allowed to dry out a minimum of twenty-eight (28) days, clean exterior and interior brick surfaces with "Sure Klean" cleaning agent, as manufactured by Process Solvent Co., Inc.

3.13 Product to be determined by consulting cleaner manufacturer and the brick manufacturer.

3.14 Before cleaning agent is applied, thoroughly wet wall down with clear water.

3.15 Apply solution over no area greater than twenty (20) square feet, clean with a stiff fiber brush, then hose down with clean water immediately after cleaning, removing all traces of cleaning agent.

3.16 Protect all trim, windows or concrete against contact with the solution.

End of Section 04200

SECTION 06 41 16
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including high-pressure decorative laminate adhesive for bonding plastic laminate fire-retardant-treated materials and cabinet hardware and accessories.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.
3. Thermoset decorative panels.

D. Samples for Verification:

1. Plastic laminates, 12 by 12 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

2. Wood-grain plastic laminates, 24 by 24 inches, for each type, pattern and surface finish, with one sample applied to core material and specified edge material applied to one edge.
3. Thermoset decorative panels, 12 by 12 inches, for each color, pattern, and surface finish, with edge banding on one edge.
4. Corner pieces as follows:

    a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.

5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Glass.
5. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. Type of Construction: Face frame.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Reveal Dimension: 1/2 inch.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. As indicated on the drawings.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Bottom of Upper Wall Cabinets: Finish bottom of all upper wall cabinets with minimum VGS -0.028 inch, 0.7mm.

1. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.3 mm thick PVC, solid, high impact, purified, color-thru, acid-resistant, PVC edging machine-applied with hot melt adhesives, automatically trimmed and inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design. Use for door/drawer edges in compatible color as selected by the Architect from the manufacturer' s standard colors.
2. Pattern Direction: As indicated.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

   a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
   b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
   c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Match Architect's sample.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
   2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
   3. Softwood Plywood: DOC PS 1, medium-density overlay.
   4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
   5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
   2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
   3. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
   1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
   2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity,

250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Panel Source International, Inc.; Pyroblock Platinum.
b. SierraPine; Medite FR.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 11 "Door Hardware (Descriptive Specification)."

B. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

D. Shelf Rests for Drilled Holes: BHMA A156.9, B04013; metal.

E. Drawer Slides: BHMA A156.9.
1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
2. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
3. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
4. For computer keyboard shelves, provide Grade 1HD-100.
5. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
6. NO METABOX DRAWER SYSTEMS ALLOWED, NO EXCEPTIONS.

F. .

G. Drawer Locks: BHMA A156.11, E07041.

H. Drawer Silencers: BHMA A156.16, L03011.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 Undercounter Metal Supports: Provide Work Station Brackets, in sizes required, as marketed by A & M Hardware, Inc., Website: www.AandMhardware.com, Phone: 888-647-0200, Fax: 717-664-4582,.

1. Color: As selected by the Architect from standard colors (2 colors may be selected).

2.6 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Urea formaldehyde.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Perimeter joints of exterior openings where indicated.
   b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   c. Joints between plumbing fixtures and adjoining walls, floors, and countertops. Joints between wall and backsplash at counters.
   d. Other joints as indicated.
   e. Joints between dissimilar materials.

2. Interior joints in the following horizontal traffic surfaces:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
   c. Other joints as indicated.

B. Related Sections include the following:

1. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
2. Division 09 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
3. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.
4. Division 32 for sealing joints in pavements, walkways, and curbing.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

B. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the Notice to Proceed with the Work.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS[AH1]

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Single-Component Neutral-Curing Silicone Sealant:

1. Products:

    a. Dow Corning Corporation; 791.
    b. GE Silicones; SilPruf NB SCS9000.
    c. Pecora Corporation; 865.
    d. Tremco; Spectrem 3.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: As indicated.
4. Use Related to Exposure: As indicated; NT (nontraffic).
5. Uses Related to Joint Substrates:

    a. As applicable to joint substrates indicated, O.

        1) Ceramic tile
        2) Plastic laminate to gypsum drywall/ CMU at backsplashes

C. **Sealant Contractor's Option**: At the sealant contractor's option, urethane sealants (nonsag and/or pourable) may be single- or multi-component. However, the sealant systems used must meet the Use Classification of the joints being sealed.

D. Nonsag Urethane Sealant - **Multicomponent**:

1. Products:

    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 240.
    c. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
    d. Sonneborn, Division of ChemRex Inc.; NP 2.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: As indicated.
4. Uses Related to Exposure: As indicated.
5. Uses Related to Joint Substrates:

    a. M - masonry
    b. G - glass
    c. A - aluminum
    d. And, as applicable to joint substrates indicated, O.

        1) Color anodic aluminum
        2) Aluminum coated with a high-performance coating
        3) Galvanized steel
        4) Brick
        5) Ceramic tile

E. Nonsag Urethane Sealant - **Single-Component**:

1. Products:

    a. Sika Corporation, Inc.; Sikaflex - 1a.
    b. Sonneborn, Division of ChemRex Inc.; Ultra.

c. Pecora Corporation; Dynatrol I-XL.
d. Tremco; Vulkem 921.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: As indicated.
4. Uses Related to Exposure: As indicated.
5. Uses Related to Joint Substrates:

a. M - masonry
b. G - glass
c. A - aluminum
d. And, as applicable to joint substrates indicated, O.

1) Color anodic aluminum
2) Aluminum coated with a high-performance coating
3) Galvanized steel
4) Brick
5) Ceramic tile

F. Pourable Urethane Sealant - **Multicomponent**:

1. Products:

a. Meadows, W. R., Inc.; POURTHANE.
b. Pacific Polymers, Inc.;
Elasto-Thane 227 High Shore Type I (Self Leveling).
c. Pecora Corporation; Urexpan NR-200.
d. Polymeric Systems Inc.; PSI-270SL.
e. Schnee-Morehead, Inc.; Permathane SM 7201.
f. Tremco; Vulkem 245.
g. Pecora Corporation; Dynatrol II-SG.
h. Sika Corporation, Inc.; Sikaflex - 2c SL.
i. Sonneborn, Division of ChemRex Inc.; SL 2.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: As indicated.
4. Use Related to Exposure: As indicated.
5. Uses Related to Joint Substrates:

a. M - masonry
b. G - glass
c. A - aluminum
d. And, as applicable to joint substrates indicated, O.

1) Color anodic aluminum
2) Aluminum coated with a high-performance coating
3) Galvanized steel
4) Brick
5) Ceramic tile

G. Pourable Urethane Sealant - **Single-Component**:

1. Products:

a. Sika Corporation, Inc.; Sikaflex - 1CSL.
b. Sonneborn, Division of ChemRex Inc.; SL 1.

c. Tremco; Vulkem Nova 45 SSL.
d. Bostik Findley; Chem-Calk 950.
e. Pecora Corporation; Urexpan NR-201.
f. Polymeric Systems Inc.; Flexiprene 952.

2. Type and Grade: S (single component) and P (pourable).
3. Class: As indicated.
4. Uses Related to Exposure: As indicated.
5. Uses Related to Joint Substrates:

a. M - masonry
b. G - glass
c. A - aluminum
d. And, as applicable to joint substrates indicated, O.

1) Color anodic aluminum
2) Aluminum coated with a high-performance coating
3) Galvanized steel
4) Brick
5) Ceramic tile

H. Door Jamb / Floor Intersections:

1. Seal joint at intersection of door jambs and VCT flooring with Pecora 898 Silicone Sanitary Sealant.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20+.
d. Schnee-Morehead, Inc.; SM 8200.
e. Tremco Incorporated; Tremflex 834.

2. Uses Related to Joint Substrates:

a. Specific application for use with Moisture-Resistant Sheathing Board
b. And, as applicable to joint substrates indicated, O.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical sealants are specified in Section "Gypsum Board Assemblies."

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Seal space between backsplash and wall with sealant.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 07 92 10
SECURITY SEALANTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes all labor, materials, equipment and services to provide security sealants as shown on the Drawings and specified herein. Included are the following topics:

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 26 05 33 - Conduits

C. Section 28 50 40 – Video Surveillance System

1.3 SUBMITTALS

A. Submittals shall be prepared in accord with the requirements of Div. 01 and must include the following information:
   1. Manufacturer's product data for each security sealant specified.
   2. Provide descriptive literature, cut sheets, and performance data on any and all security sealants used to security equipment.

1.4 QUALITY ASSURANCE

A. Materials under this specification shall be provided by one of the manufacturers listed. Security sealants by other manufacturers may be considered upon written approval of the Architect. Requests for substitution shall include all pertinent technical data, descriptive product literature, and product specifications and must be received at least 7 days prior to the bid opening.

B. Prospective manufacturers shall be able to furnish materials that meet or exceed the requirements of this specification. Manufacturers must be in good financial standing, and able to demonstrate that they have been actively engaged in the manufacturing of detention furnishings for a minimum of 5 years.

C. Upon receipt of request for substitution, the A/E will make an investigation to determine the ability of the manufacturer to perform the work. The A/E reserves the right to request additional information as deemed necessary for the determination process. Upon approval, the prospective manufacturer will be listed by addendum.

D. Unless specified otherwise, the following are approved manufactures of security sealants:
   1. Pecora Corporation – Harleysville, Pennsylvania
   2. BASF Construction Chemicals – Shakopee, MN

PART 2 - PRODUCTS

2.1 PICK RESISTANT SEALANT

A. Manufacturer/Series:
   1. Pecora Dynaflex SC
   2. Equal products by approved manufacturers also acceptable
      a. Meets Federal Specification TT-S-00230C, Type II, Class B
      b. Meets ASTM C-920-98, Type S, Grade NS, Class 12.5
      c. ASTM C661 Shore A Hardness: 55 +/-5
      d. ASTM D412 Tensile Strength: 250 psi
      e. ASTM D3960 VOC Content (g/L): 15

2.2 PICK PROOF SEALANT

A. Manufacturer/Series:
   1. Pecora Dynapoxy EP-1200
   2. Equal products by approved manufacturers also acceptable
      a. Meets ASTM C-881, Type I and III, Grade 3, Classes B & C
      b. ASTM C661 Shore D Hardness: 70
      c. ASTM D695 Compression Strength: 11,000 psi
      d. ASTM D3960 VOC Base (g/L) Content: 0
      e. ASTM D3960 VOC Activator (g/L) Content: 0

PART 3 - EXECUTION

3.1 COORDINATION

A. The SEC shall verify all job site conditions before installation begins.

3.2 INSTALLATION

A. Install security sealant in accord with manufacturer's recommendations.

B. All surfaces must be clean, dry, and free of all foreign matter or contamination such as oil, grease, wax, bitumen, curing compounds form-release agents or other coatings.

C. Old caulking material should be removed from masonry joints by grinding or sawing to sound virgin substrates to insure optimum performance of the new sealant.

D. Metal surfaces must be free of rust, corrosion and protective coatings.

E. The SEC must be present on site prior to the installation of security sealants to coordinate proper placement, location and setting with the Division 09 – Security Sealant Contractor.

F. All metal to metal masonry shall be completely filled and shall contain no cracks or seams that can be used for passage or storage of contraband.

G. Tool at once after application to ensure full adhesion.

3.3 CLEANING

A. Clean all exposed surfaces according to manufacturer's instructions upon completion of project.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hollow metal doors.
2. Hollow metal door frames.
3. Sidelight frames
4. Borrowed-light frames.
5. Fire-rated door and frame assemblies, including sidelights.

B. Specification Note: This Section has been edited to include frames and doors that are not detention types. An **all-inconclusive statement** such as "**all interior doors or frames**" made herein **refers only to interior doors provided under this Section**.

C. Related Sections include the following:

1. Division 04 Section "Unit Masonry" for installing anchors and grouting frames in masonry construction,
2. Division 08 Section "Flush Wood Doors" for wood doors installed in steel frames.
3. Division 08 Section "Commercial Door Hardware for door hardware and weather stripping.
4. Division 08 Section "Glazing" for glass in glazed openings in doors and frames.
5. Division 09 Section "Painting" for field painting factory-primed doors and frames.
6. Division Section 08 Section "Detention Doors and Frames" for detention type doors and frames.
7. Division 08 Section "Security Door Hardware" for security type door hardware.

1.3 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

B. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Door and Frame Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

1.5 QUALITY ASSURANCE

A. Hollow Metal Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test using positive-pressure testing, unless otherwise noted or allowed by authorities having jurisdiction.
2. Door labels are to be mounted on the frame head and on the top of doors where continuous hinges are specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Do not use plastic or canvas shelters. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hollow Metal Doors and Frames:

a. Amweld Building Products, Inc.
b. Ceco Door Products; a United Dominion Company.
c. Curries Company.
d. Mesker Door, Inc.
e. Pioneer Industries Inc.
f. Republic Builders Products.
g. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets for All Door Faces: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Metallic-Coated Steel Sheets for Exterior Doors and Frames: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

D. Electrolytic Zinc-Coated Steel Sheet for Interior Doors and Frames: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

A. General: Provide doors of sizes, thicknesses, and designs indicated.

B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush), with 0.053-inch- (1.3-mm-) 16 gage minimum thick faces.

C. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Interior Door Frames of 0.042-inch- (1.0-mm-) [18 gage] minimum thick steel sheet for:

1. All interior doors, unless noted otherwise.

C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

D. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

E. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) [7 gage minimum] thick, electrolytic zinc-coated or metallic-coated steel sheet.

1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.

F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

A. General: Fabricate hollow metal door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

C. Interior Door Faces: Fabricate exposed faces of doors and panels from the following material:

1. Cold-rolled steel sheet.

D. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

F. Clearances for Fire-Rated Doors: As required by NFPA 80.

G. Single-Acting, Door-Edge Profile: Beveled edge.

H. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

I. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

J. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

K. Thermal-Rated (Insulating) Assemblies: At exterior locations provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

L. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

1. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings wider than 36-inch with mortise/butt type hinges at top hinge locations.

M. Frame Construction: Fabricate frames to shape shown.

1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.

2. Provide welded frames with temporary spreader bars.

N. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

O. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

P. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass and other panels in doors, unless noted otherwise.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install hollow metal doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
3. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
4. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
5. Install fire-rated frames according to NFPA 80.
6. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

   a. Swinging doors.
   b. Other doors to the extent indicated.

2. Cylinders for doors specified in other Sections.

B. Related Sections:
1. Division 08 Section "Hollow Metal Doors and Frames" for astragals furnished as part of fire-rated labeled assemblies.
2. Division 08 Section "Aluminum Frames" for door silencers furnished as part of frames.
3. Division 08 Section "Flush Wood Doors" for astragals as part of fire-rated labeled assemblies.
4. Division 08 Section "Stile and Rail Wood Doors" for astragals and integral intumescent seals furnished as part of fire-rated labeled assemblies.
5. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except including cylinders.
6. Division 08 Section "All-Glass Entrances and Storefronts" for entrance door hardware, except including cylinders.
7. Division 08 Section "Automatic Entrances" for entrance door hardware, except including cylinders.
8. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
9. Division 28 Section "Access Control" for access control devices installed at door openings and furnished as part of a security access system.
10. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and furnished as part of an intrusion detection system.
11. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified and access control hardware, indicating the following:

1. System Block Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following for each unique electrified opening:

    a. Point-to-point system wiring and riser diagrams.
    b. Elevation diagram of each door.
    c. Operational description.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

    a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

        1) Sequence of Operation: Include description of component functions including, but not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:

1. Approved hardware schedule, catalog cuts and keying schedule.
2. Furnish keying bitting list in paper and electronic format by registered mail directly to facility manager owner.
3. Hardware installation and adjustment instructions.
4. Manufacturer's written warranty information.
5. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.4 QUALITY ASSURANCE

A. Door Hardware Installer Qualifications: An experienced and factory trained Installer who has completed both standard and electrified builders hardware and integrated access control installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Door Hardware Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity which is not more then a half day of travel from the jobsite and who employs a qualified Architectural Hardware Consultant or equivalent experience available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Supplier recognized by manufacturers to be a direct factory-authorized distributor of the specified hardware products. Supplier is required to be available for onsite meetings with one days notice regarding issues that arise with opening functions, installation, keying, on-site warehousing, trouble shooting of products, and final punch out related issues.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC) and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single source manufacturer and supplier, unless otherwise indicated.

1. Furnish electrified door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Furnish standard door hardware, electrified door hardware and access control door hardware as a single sourced package from the same qualified supplier.
3. Furnish exterior door hardware from the same manufactures as the interior door hardware, no deviations will be allowed.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with "Americans with Disabilities Act" (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, and "Texas Accessibility Standards" (TAS) as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
b. Thresholds: Not more than 1/2 inch high.

3. International Building Code (2006).

F. Fire-Rated Door Assemblies: Furnish door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

1. Test Pressure: Positive pressure labeling.

G. Low energy power operator installer qualifications: Local certified ASSA ABLOY Power Operator Preferred Installer required for both the installation and maintenance of the operator units specified for this project. Install and maintain low energy operators in accordance with ANSI 156.19, ANSI 117.1, NFPA 101 and local applicable codes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. One complete shipment of door hardware as detailed in approved Door Hardware Schedule Shop Drawings to be inventoried on site and upon receipt of material is secure in lock-up room furnished with shelving for door hardware. Do not store electronic access control hardware, software or accessories at Project site without prior authorization and climate controlled facility, failure to do so will void electronic warranties.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cylinders, cores, access control credentials, electronic key software with loaded bitting and key records per cylinder, and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference". Hardware Supplier must be a regional supplier to address owner questions and concerns relating to keying issues that arise as project close-out.

1.6 COORDINATION

A. Templates: Door Hardware Supplier to furnish and distribute to the parties involved for templating for doors, frames, and other work specified to be factory prepared for installing standard, electrified and access control door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Access Control and Electrical Connections: Door Hardware supplier with door and frame supplier to coordinate the layout and installation of scheduled electrified door hardware with required connections to source power junction boxes, power supplies and security products.

C. Keying Conference: Door Hardware Supplier to conduct keying conference to comply with requirements in Division 1 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document prior to any material being ordered:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Review all lock and exit device functions when reviewing keying requirements.
4. Requirements for key control system.
5. Installation of permanent keys and cylinder cores.
6. Address the requirements for delivery of keys.
7. Address keying and cylinder stamping (identification) as required by owner or owner representative.
8. Establish method of submitting electronic format of keying systems and diagram and to be produced and furnished by Hardware Supplier.

D. Pre-Installation Conference: Hardware Supplier to conduct conference at Project site attended by representatives of Door Hardware Manufacturers, Hardware Installers, Owner Representative and General Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. On site training should not be less then four hours of on-site training by qualified Hardware Supplier and Manufactures. At completion of installation and final walk through, furnish written certification that hardware items were applied according to conference recommendations and to finish hardware specifications.

E. Existing Conditions: Door Hardware Supplier is responsible for coordination with existing conditions and hardware specified in Hardware Sets. The hardware specified in the Hardware Sets are to be considered the intent of applicable products for a complete opening solution as required by the use and functions of the opening. The Hardware Sets specified are to be considered the base bid, upon review of existing conditions and where as items specified in the Hardware Sets will not comply with existing conditions, the supplier shall address the concerns and propose solutions to the contractor and architect in writing. Existing conditions field verification shall be done prior to submitting shop drawings with recommendations included in shop drawings. No deviations will be acceptable, supplier shall include the cost of trip charges to the site for verification. Any unforeseen conditions will be considered for proposal request.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of standard, electrified hardware and access control hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Two year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Five years for mortise locksets.
2. Five years for exit devices.
3. Ten years for manual door closers.
4. Two years for electromechanical door hardware.
5. Five years for Thresholds, Door Sweeps, Gasketing, Perimeter Weatherstripping.

E. Extended Warranty: As requested by either the Owner or Architect furnish a separate optional extended warranty and maintenance contract for access control system and power assist operated openings. Version upgrades and "fix" releases to the software, beyond the general warranty time period, are available at no extra charge only if the end user is under a valid extended warranty and maintenance contract.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, furnish six months' full maintenance by skilled employees of door hardware and integrated access control systems suppliers and installers. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Furnish parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Furnish door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Furnish quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
2. Sequence of Operation: Furnish electrified and access control hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule. (Source manufacturer listed in boldface).

2.2 HINGES AND PIVOTS

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Hinges:

   a. Hager Companies (HA).
   b. McKinney Products (MC).
   c. Stanley Hardware (ST).

2. Continuous Barrel Hinges (Stainless Steel):

   a. McKinney Products (MC).
   b. Markar Manufacturing (MA).
   c. Pemko Manufacturing (PE).

3. Continuous Geared Hinges (Aluminum):

   a. Bommer Industries (BO).
   b. McKinney Products (MC).
   c. Pemko Manufacturing (PE).

4. Pivots Hinges:
   a. **Rixson Hardware (RX).**

5. Floor Pivots:
   a. **Rixson Hardware (RX).**

B. Standards: BHMA Certified products complying with the following:

1. Butts and Hinges: BHMA A156.1.
2. Continuous Geared Hinges: BHMA A156.26.
3. Pivots: BHMA A156.4.
4. Template Hinge Dimensions: BHMA A156.7.
5. Self-Closing Hinges: BHMA A156.17.
6. Floor Hinges: BHMA A156.4.

C. Quantity: Furnish the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, furnish 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches.

D. Pivot Hinges: Furnish 3/4" offset, single acting pivots with one intermediate pivot for doors less than 91 inches high and two intermediate pivots for doors between 91 inches and 121 inches in height. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high.

E. Floor Pivots: Furnish 3/4" offset, single acting floor closer complete with top and intermediate pivots according to manufacturer's recommendation. Options include availability for use on fire labeled; lead lined and extra heavy weight doors. Furnish extended spindles as required for

finish floor thickness, threshold thickness and coordinate undercut on doors prior to ordering base floor pivots.

1. Flush Floor Plates and Thresholds: Furnish finish cover plates or thresholds as indicated in door hardware sets for floor pivots. Match door hardware finish, unless otherwise indicated.

F. Hinge Size: Furnish the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches) Standard Weight	Heavy Weight
36-in by 86-in by 1-3/4	4-1/2	0.134	0.180
< 36-in by 120-in by 1-3/4	5	0.146	0.190

G. Hinge Weight and Base Material: Unless otherwise indicated, furnish the following:

1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
2. Interior Doors: Heavy weight, ball bearing hinges unless Hardware Sets indicate standard weight.
   a. Standard weight hinges can be used at Mechanical, Electrical, IDF, Data, and Offices with out closers openings, regardless of specified hinge weight in hardware sets.

H. Hinge Height Clarifications: Where uneven door leafs occur, the widest door leaf in the pair determines the height and weight of the hinges on the inactive and active door leafs; to ensure equal size hinges on opening.

I. Hinge Weight Clarification: If heavy weight hinges are specified in hardware sets for interior aluminum frames then standard weight hinges can be used. If aluminum frame opening has a door over 42 inches or greater then an additional hinge in lieu of heavy weight or 5 inch hinges.

J. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:

1. Non-removable Pins: Furnish set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

   a. Out-swinging exterior doors.
   b. Out-swinging access controlled doors.

2. Electric Hinges: Furnish electric transfer hinges with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Furnish sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

K. Continuous-Geared Hinges (Aluminum): Minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame. Fabricate hinges non-handed and to template screw locations. Continuous hinges guaranteed for the life of the opening.

L. Continuous Barrel Hinges (Stainless Steel): Hinges to be made of 14 GA. type 304 Stainless Steel with concealed Teflon-coated stainless steel pin, and twin self-lubricated nylon bearings at each 2 inch knuckle. Fabricate hinges non-handed and to template screw locations.

M. Accessible Electrical Transfer Continuous Hinges: Furnish electric transfer continuous hinges with a 12" removable hinge modification accessible without de-mounting door from the frame and standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Furnish sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

N. Electrical Power Transfer: Furnish EPT where it is required per exit device manufactures requirements and warranty for more then 1 amp of inrush for latch retraction of exit device bolt. Furnish prep in door, frame, and continuous hinge. Furnish a secure and unobtrusive means of channeling electrical wiring from the door frame into the door itself by concealing internal wires for low voltage electrified door hardware. Furnish an Electrical Power Transfer fully manufactured with metal.

1. Acceptable Manufacturers:

   a. Securitron Door Controls (SN) – EL-CEPT-12/22 series
   b. Von Duprin (VO) – EPT-10 Series

O. Furnish mortar guard enclosure on frames at each electrical hinge location specified.

2.3 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following: Surface Bolts: Flush Bolts and Coordinators:
   a. Rockwood Manufacturing (RO).
   b. Trimco Manufacturing (TR).
   c. Ives (IV).

B. Standards: Comply with the following:

1. Surface Bolts: BHMA A156.16.
2. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
3. Manual Flush Bolts: BHMA A156.16.

C. Surface Bolts and Flush Bolts: BHMA Certified Grade 1.

D. Furnish bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor regardless if detailed as such in hardware sets. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8” in length, unless otherwise noted and U.L. listed for labeled fire doors.

E. Furnish Self-Latching flush bolts as follows:

1. Access control inactive door leaf.
2. Uneven inactive door leaf.

F. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.4 LOCKS AND LATCHES

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Mechanical Bored Locks and Latches:
   a. **Yale Locks & Hardware (YA) – 8800FL Series**

B. Standards: Comply with the following:

1. Mortise Locks and Latches: BHMA A156.13.
2. Bored Locks and Latches: BHMA A156.2.
3. Interconnected Locks and Latches: BHMA A156.12.
4. Auxiliary Locks: BHMA A156.5.

C. Mortise Locks: BHMA Certified Grade 1, Series 1000.

D. Bored Locks: BHMA Certified Grade 1, Series 4000.

E. Interconnected Locks: BHMA Certified Grade 2, Series 5000.

F. Auxiliary Locks: BHMA Certified Grade 1.

G. Lock Trim: Match the following design style:

1. Levers:
   a. **Yale Locks & Hardware (YA) – AUR**

H. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
1. Bored Locks: BHMA A156.2.

I. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw, with stainless steel bolt.
2. Bored Locks: Minimum 1/2-inch latchbolt throw, 3/4” latchbolt throw at fire rated pairs.
3. Deadbolts: Minimum 1-inch bolt throw.

J. Backset: 2-3/4 inches unless otherwise indicated.

2.5 ELECTRIFIED LOCKS

A. Manufacturers: Subject to same compliance standards and requirements as mechanical locksets, furnish products by one of the following:

B. Integrated Proximity Card Key Locksets: Wiegand™ compatible electronic access control mortise or bored lockset with integrated proximity card reader included in the trim. Grade 1 lockset consisting of a hard wired, solenoid driven unit allowing locking/unlocking of the lever handle trim, door status switch (mortise lock) monitoring, latchbolt and deadbolt monitoring and request-to-exit signaling. Card reader is HID based technology programmable via panel interface board and third party networked access control software.

1. Integrated Proximity Card Key Locksets Sleek and Sophisticated Design:

a. **Yale Locks & Hardware (YA) - Symphony Series.**

C.

D. Electromagnetic Locks: Electromagnetic locks shall be heavy duty, surface mounted type conforming to ANSI A156.23, Grade 1 with a minimum holding force of 1,200 lbs... Locks shall be capable of either 12 or 24 voltage and be UL listed for use on fire rated door assemblies. Electronics are to be fully sealed against tampering and allow exterior weatherproof applications. Regardless if specified in hardware sets furnish complete mounting brackets and housings. Furnish magnetic locks with easy mounting block for simple and ease of installation and removal of magnetic lock. Furnish magnetic locks with integral LED indicator, Bond Sensor and Door Position Sensor. Power supply to be by the same manufacturer as the lock with combined products having unlimited lifetime warranty.

1. Concealed Mount Electromagnetic Locks (Fail Safe):
   a. Securitron Door Controls (SE) - SAMBD Series.

E. Integrated Delayed Egress Electromagnetic Locks: Electromagnetic locks shall be heavy duty, surface mounted type conforming to ANSI A156.23, Grade 1 with a minimum holding force of 1,200 lbs. Locks shall be capable of either 12 or 24 voltage and be UL listed for use on fire rated door assemblies. Electronics are to be fully sealed against tampering. Integrated Delayed Magnetic Locks to be specified in the hardware sets. Devices to conform to NFPA 101 - Special Locking Arrangements for delayed egress. Nuisance delay to be available as standard for either zero (0) or two (2) seconds. Internal standard 10-second delay for "Authorized Entry" to be standard features on every device, supplied standard with sign on door with 1 ½" tall contrasting letters to read "Emergency Exit Only – Push until alarm sounds. Door can be opened in 15 seconds." Regardless if specified in hardware sets furnish complete mounting brackets and housings. Furnish magnetic locks with integral LED indicator, Bond Sensor and Door Position Sensor. Power supply to be by the same manufacturer as the lock with combined products having unlimited lifetime warranty.

1. Surface Mount Electromagnetic Locks (Fail Safe):
   a. Securitron Door Controls (SE) - iMXD Series.

2.6 CYLINDERS AND KEYING

A. Standards: Comply with the following:

1. Cylinders: BHMA A156.5.
2. Key Control System: BHMA A156.5.

B. Cylinder Grade: BHMA Certified Grade 1.

C. Keying System: Unless otherwise indicated, furnish for a keying system complying with the following requirements:

1. Existing Grand Master Key System: Cylinders are factory keyed operated by a change key, master key, and a grand master key. Conduct keying meeting with End User to define and document keying system instructions and requirements prior to ordering any material on project.

D. Keys: Furnish nickel-silver keys complying with the following:

1. Stamping: Permanently inscribe each key with a visual key control number and as directed by Owner.
2. Quantity: Furnish the following:
   a. Cylinder Change Keys (Per Key Set): Four.
   b. Master Keys (Per Level): Five.
   c. Grand Master Keys: Two.
   d. Construction Control Keys: Two.
   e. Permanent Control Keys: Two.
   f. Extra Keyed Permanent Cores: Ten.
   g. Extra Blank Keys: Fifty.

E. Key Registration List: Furnish keying transcript list to Owner's representative for lock cylinders.

F. Key Control System: Furnish one lockable cabinet for key control and storage for up to 150 percent capacity, type and model to be determined in the keying meeting with the owner. Furnish End User with one copy of "Key Wizard" key management software program

2.7 STRIKES

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Electric Strikes: BHMA Certified Grade 1.
   a. **Hanchett Entry Systems (HE) – 1000, 5900, 9600 Series.**

B. Standards: Comply with the following:

1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Mortise Locks and Latches: BHMA A156.13.
3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
5. Dustproof Strikes: BHMA A156.16.
6. Electric Strikes: BHMA A156.5.

C. Strikes: Furnish manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Furnish manufacturer's special strike box fabricated for aluminum framing.

D. Furnish electrified products with an in-line power controller that enables the hardware to operate from 12 to 32 volts. On board safety features shall include an in-line fuse to protect the hardware and host system from any possible reverse current surges. The controller shall regulate current to furnish continuous duty operation without the typical head build up. Adding the in-line power controller with electrified products furnishes unlimited lifetime warranty of electrified products.

2.8 EXIT DEVICES

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Exit Devices:
   a. **Yale Locks & Hardware (YA) - 7100 Series.**

2. Exit Device Trim, Pull/Lever:
   a. **Yale Locks & hardware (YA) – AU**

3. Electrified Options: As indicated in hardware sets, furnish electrified exit device options including: electric latch retraction, electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, furnish electrified exit devices standard as fail secure on lever or trim side, always free egress on push side or fail safe.

   a. If exit device requires over 1 amp of in-rush then furnish manufactures power supply to comply with warranty requirements, one power supply per two door leafs. Furnish power supply with applicable relay and control boards for complete operation and integration of associated hardware with opening which may require: auto operator, card access, fire alarm, delayed egress and alarmed control boards devices.
   b. If exit devices requires over 1 amp of in-rush then furnish Electric Power Transfer (EPT), coordinate preps of door, frame and continuous hinges; unless exit device manufacture has approved listed through wire products with standardized connectors.
   c. Option for Delayed Egress exit devices to be specified in the hardware sets. Devices to conform to NFPA 101 - Special Locking Arrangements for delayed egress. Nuisance delay to be available as standard for either zero (0) or two (2) seconds. Internal latchbolt monitoring, and a standard 10-second delay for "Authorized Entry" to be standard features on every device, supplied standard with sign on door with 1 ½” tall contrasting letters to read “Emergency Exit Only – Push until alarm sounds. Door can be opened in 15 seconds.” Delayed egress feature to be available throughout all styles and sizes of exit devices including: Panic and Fire rated Rim, Wide and Narrow Stile, Mortise, Surface Vertical Rod, and Concealed Vertical Rod.

B. Standard: BHMA A156.3.

C. Exit Devices: BHMA Certified Grade 1.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

1. Integrated Proximity Card Key Locksets Sleek and Sophisticated Design:

   a. **Yale Locks & hardware (YA) - Symphony Series.**

F. Surface Vertical Rod Exit Devices: Furnish and install interior surface and concealed vertical rod exit devices as Less Bottom Rod unless otherwise indicated.

G. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

H. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.

I. Through Bolt Installation: For exit devices and trim as required for fire rated wood doors. Where through bolts are used, coordinate the color of bolt on opposite of device with BHMA finish color similar to the color of door finish surface.

2.9 ACCESSORIES FOR PAIRS OF DOORS

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Coordinators:
   a. **Rockwood Manufacturing (RO).**
   b. Trimco Manufacturing (TR).

2.10 CLOSERS and POWER OPERATORS

A. Manufacturers: Subject to compliance with requirements, furnish products by one the following:

1. Surface-Mounted Closers (Heavy Duty): BHMA Certified Grade 1 (to be used at exterior, cross corridor and high frequency use openings):

   a. **Yale Locks & Hardware (YA) - 4400**
   b. Norton Door Controls (NO) – 7500:
      1) Approved Arms: Reg, PR, CLP, CLP-T, UNI, UNI-T
   c. Sargent Manufacturing (SA) – 351:
      1) Approved Arms: O, P10, PS, PSH, CPS, CPSH

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.
2. Power Operators: BHMA A156.19.

C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Furnish non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force.

D. Closer Options: As indicated in hardware sets, furnish door closer options including: delayed action, hold open arms, extra duty cast or forged parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets. Where through bolts are used, coordinate the color of bolt on opposite of device with BHMA finish color similar to the color of door finish surface. Bent steel or threaded rod arms are not acceptable unless clearly specified in the Hardware Sets.

1. Furnish Delayed Action (DA) feature in closers at Laboratories, Shipping and Receiving doors and where cart traffic is active.
2. Furnish shock absorbing arm such as Spring or Rubber Cushion at exterior outswing openings.

E. Power assist operators as surface mounted, electric low energy type conforming to ANSI A156.19 requirements and capable of meeting ANSI A117.1 guidelines. Outputs and relays required to be on board in the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

1. Outputs and relays on board the operator allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.
2. Electronic Controls to be microprocessor controlled unit shall control the operation and switching of the swing power operator. The electronic control furnished with low voltage power supply for all means of actuation. Electronic encoder to determine absolute open and close position.

2.11 OPERATING and PROTECTIVE TRIM UNITS

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Metal Protective Trim Units:
   a. **Rockwood Manufacturing (RO).**
   b. Trimco Manufacturing (TR).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate protection plates from the following:

1. Brass/Bronze and Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.

D. Push-Pull Design: 1" Round with 10" Centers. Furnish 90 degree offset pulls at exterior openings.

E. Fasteners: Furnish manufacturer's designated fastener type as indicated in door hardware sets.

F. Furnish protection plates sized 2 inches less than door width (LDW) on push side and 1 inch less door width on pull side by height specified in door hardware sets.

G. Coordinate stainless steel hinges, door edges, kickplates and armor plates with less then .09375 inches between meeting edges, regardless of specified sizes in hardware sets.

H. At fire rated openings with protection plates ensure they are listed by third party, plates to be embossed with listing agency approval. Ensure wood door and hollow metal door manufactures are accepting of protection plates prior to quoting and submitting bid.

2.12 STOPS AND HOLDERS

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Stops and Holders:
   a. **Rockwood Manufacturing (RO).**

b. Trimco Manufacturing (TR).

B. Standards: Comply with the following:

1. Stops and Bumpers: BHMA A156.16.
2. Electromagnetic Door Holders: BHMA A156.15.
3. Combination Overhead Holders and Stops: BHMA A156.8.
4. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Certified Grade 1.

D. Electromagnetic Door Holders for Labeled Fire Door Assemblies: Coordinate with fire detectors and interface with fire alarm system. Magnetic door holders shall meet or exceed ANSI A156.15 and be UL listed 228 for Door Closer and Holders, with or without integral smoke detectors. Holding force shall be 25 to 40 pounds and shall be fail-safe. Pushpin release that eliminates residual magnetism shall be standard. Furnish magnetic hold-opens with triple-voltage coil that can receive 12 VDC, 24 VAC/DC, or 120VAC; or coordinate required voltage with electrical. Subject to compliance with requirements, furnish products by one of the following:

1. **Rixson Hardware (RX) - 980 Series.**
2. Sargent Manufacturing (SA) - 1560 Series.

E. Combination Overhead Stops and Holders: Certified BHMA Grade 1.
1. **Rixson Hardware (RX) – 9 and 10 Surface Series.**
2. Sargent Hardware (SA) – 590 and 1540 Surface Series.

F. Provide Overhead Concealed stops at public spaces such as conference, corridors, and office spaces where wall or floor stops are not applicable condition.

G. Provide Overhead Surface stops at non-public spaces such as mechanical, electrical, storage spaces.

H. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.

1. Where floor or wall stops are not appropriate, furnish overhead stops.

I. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Furnish (3) per single door and (2) per paired door frame if applied gasketing is not specified in Hardware Sets.

2.13 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

A. Manufacturers: Subject to compliance with requirements, furnish products by one of the following:

1. Door Thresholds, Weatherstripping and Gasket Seals:
   a. NGP Manufacturing (NG)
   b. Pemko Manufacturing (PE).

B. Standard: Comply with BHMA A156.22.

C. General: Furnish continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Furnish non-corrosive fasteners for exterior applications.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.

D. Furnish thresholds to meet ADA compliance height, coordinate threshold height with floor pivots, finish floor thickness and door undercut. Extended spindles on pivots may be required due to construction detail and final installation; coordination requirements by door and hardware supplier are required prior to ordering material.

E. Basic Sound Seal Requirement: Whether indicated on the drawings or not, furnish gasketing MCKS88BL at sound rated wall types and at the following areas for limiting of sound transmission: private offices, exams, conference, private toilets, corridor openings, rooms and similar sound sensitive area.

F. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Furnish smoke labeled perimeter gasketing at all smoke labeled openings.

G. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Intumescent Seals and Gasketing: Furnish concealed, Category A type gasketing systems on assemblies where an intumescent seal is required to meet IBC and UL-10C positive pressure labeling.

H. Provide Perimeter Weatherstripping at Exterior Hollow Metal Frames, Install prior to templating and installing exit devices and closers:

1. Exterior Outswing/Inswing Openings:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):
   c. Provide Door Bottom Sweeps at Outswing Doors:

2. Exterior Outswing Openings without Overhead Protection:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

3. Exterior Outswing Openings with Overhead Protection:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

4. Exterior Hollow Metal Inswing Openings with or with out Overhead Protection:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

I. Provide Rain Drips at Exterior Openings without Overhead Protection:

1. Rain Drips:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

J. Provide Thresholds at Exterior Openings:

1. Exterior Outswing Openings:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

2. Exterior Inswing Openings:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

K. Provide Meeting Edges and Astragals at Pairs of Doors:

1. Meeting Edge Astragal Pair (Set) with Exit Devices and Cross Corridor Doors, and fire rated pairs:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

2. Meeting Edge Overlapping Astragal at with Doors with Bolts:
   a. NGP Manufacturing (NG):
   b. Pemko Manufacturing (PE):

2.14 POWER SUPPLIES

A. Power Supplies: Furnish Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Modular unit in NEMA ICS 6, Type 4 enclosure. Furnish the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment. Third party listed and labeled for use with fire alarm systems. Power supply shall be furnished with a minimum of four (4) 4 Amp/hour batteries providing battery back up. An integral battery charging circuit shall be standard. Furnish key locking cover to prevent tampering. Furnish all control boards and relay panels to sufficiently operate the opening as described and intended per hardware sets. Subject to compliance with requirements, furnish products by one of the following:

1. Boxed Power Supplies:

   a. **Securitron Door Controls (SE) - BPS Series.**

2.15 ELECTRIC DOOR ACCESSORIES:

A. Electric Door Hardware Cords: Furnish electric transfer wiring with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Furnish sufficient number of concealed wires to accommodate electric function of specified hardware. Furnish a connector for through-door electronic locking devices and another one for hinge to junction box above the opening. Wire nut connections are not acceptable at low voltage electrified hardware. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified door:

1. McKinney: Inner Door Cord 3 inches: QC-C003P
2. McKinney: Inner Door Cord 3 foot door: QC-C206P
3. McKinney: Inner Door Cord 4 foot door: QC-C306P
4. McKinney: Inner Door Cord 15 feet: QC-C1500P
5. McKinney: Hinge to Junction Panel 15 feet: QC-C1500P
6. Furnish one each of the following tools as part of the base bid contract:

    a. McKinney: Electrical Connecting Kit: QC-R001
    b. McKinney: Hand Tool for Connectors: QC-R003

B. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting. Furnish cylinder as required for complete operation, regardless if specified in Hardware Sets.

1. Manufacturer/Model:

    a. **Securitron (SE) - PB Series.**

C. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturer/Model:

    a. Securitron (SE) - DPS MSS Series...
    b. GE Security (GE) - 1078 Series.
    c. Security Door Controls (SD) – 420 Series.

D. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

1. Manufacturer/Model:

    a. **Securitron (SE) - XMS Series...**

E. **Cabinet Door Locks:** COMPX NATIONAL C81739154 Pin Tumbler Cam Door Lock Dead Bolt Satin Brass Finish Mounting Hole Dia. 57/64 In. Cam Length 3/4 In. Cam Width 7/8 In. Latching Distance 1/4 In. For Door Thickness 7/8 In. Unlock Turn Direction Left Unlocking Radius 360 Deg. Number of Pins 4 ANSI/BHMA Grade 2 Standards Key Number 915 Includes Two Keys Strike and Mounting Hardware Key Type Alike

2.16 FABRICATION

A. Fasteners: Furnish door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Furnish screws according to manufacturers recognized installation standards for application intended.

1. Furnish manufactures templated and approved stainless steel screws and fasteners for stainless steel hardware specified in the hardware sets.

B. Mounting Accessories: Furnish drop plates, filler brackets, extended length screws, through bolts, and accessories for complete mounting with door, frame, light kits, applied molding and special applications as part of the base bid with complete installation per manufactures recommendations.

1. In healthcare facilities install surface mount magnetic locks on the pull side of the doors when specified in hardware sets and located on openings in corridors. Furnish all mounting brackets with finish and beauty covers.

2.17 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Furnish quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable and temporary protective covering before shipping to jobsite.

D. Finishes on locksets, latchsets and exit devices to incorporate an FDA recognized antimicrobial coating (MicroShield™) listed for use on medical and food preparation equipment that will suppress the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

E. Furnish clear powder coat finish at exit devices located on exterior openings such as gates and at pool exit doors.

F. BHMA Designations: Comply with base material and finish requirements indicated by the following:

1. BHMA 600: Primed for painting, over steel base metal.
2. BHMA 605: Bright brass, clear coated, over brass base metal.
3. BHMA 606: Satin brass, clear coated, over brass base metal.
4. BHMA 609: Satin brass, blackened, satin relieved, clear coated, over brass base metal.
5. BHMA 611: Bright bronze, clear coated, over bronze base metal.
6. BHMA 612: Satin bronze, clear coated, over bronze base metal.
7. BHMA 613: Dark-oxidized satin bronze, oil rubbed, over bronze base metal.
8. BHMA 618: Bright nickel plated, clear coated, over brass or bronze base metal.
9. BHMA 619: Satin nickel plated, clear coated, over brass or bronze base metal.
10. BHMA 622: Flat black coated, over brass or bronze base metal.
11. BHMA 623: Light-oxidized statuary bronze, clear coated, over bronze base metal.
12. BHMA 624: Dark-oxidized statuary bronze, clear coated, over bronze base metal.
13. BHMA 625: Bright chromium plated over nickel, over brass or bronze base metal.
14. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
15. BHMA 627: Satin aluminum, clear coated, over aluminum base metal.
16. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
17. BHMA 629: Bright stainless steel, over stainless-steel base metal.
18. BHMA 630: Satin stainless steel, over stainless-steel base metal.
19. BHMA 651: Bright chromium plated over nickel, over steel base metal.
20. BHMA 652: Satin chromium plated over nickel, over steel base metal.
21. BHMA 689: Aluminum painted, over any base metal.

22. BHMA 690: Dark bronze painted, over any base metal.
23. BHMA 691: Light bronze painted, over any base metal.
24. BHMA 717: Bright aluminum, uncoated; aluminum base metal.
25. BHMA 718: Satin aluminum, uncoated; aluminum base metal.
26. BHMA 722: Dark-oxidized bronze, oil rubbed, over architectural bronze base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

C. Electrified Openings: Furnish steel doors and frames and wood doors prepared to receive electrified hardware connections specified in Door Hardware Sets without additional modification.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Furnish and coordinate concealed wood blocking for wall mount stops as detailed in Door Hardware Schedule.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: “The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the contract Documents give other specific instructions concerning these matters.”

B. Field Inspection: Supplier and Door Hardware Manufacturer will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

1. Access Control System Consultant will inspect integrated electronic and access control hardware and state in report whether installed work complies with or deviates from requirements, including whether electronic and access control hardware is properly installed and performing according to system operational descriptions.

    a. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
    b. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Replace malfunctioning or damaged items with new items.
    c. Acceptance Test Schedule: Schedule tests after pre-testing has been successfully completed and system has been in normal functional operation for at least 2 weeks.
    d. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper finish. Furnish final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SETS

A. The hardware sets listed below represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections.

B. Abbreviations used in hardware schedule.
1. A/C – Access Control
2. A/O – Automatic Operator
3. CEMHO – Closer Mount Electromagnetic Hold Open
4. Dbl Cyl – Double Cylinder
5. DT – Dummy trim
6. EMHO – Electromagnetic Hold Open
7. HO – Hold open
8. LDW – Less door width.
9. M/L – Magnetic Lock
10. NL – Night Latch
11. OW – Opening width.
12. PA – Parallel arm.
13. Reg – Regular arm mount.
14. SNB – Sex Nut and bolts
15. TB – Through bolts
16. TJ – Top Jamb mount

END OF SECTION 08 71 00

HEADING 1

Doors: 110, 117

3 ea	HINGES	T4A3786-4.5 x 4.5 x NRP x 26D	MCKINNEY
1 ea	DEADBOLT	352 x 626	YALE
1 ea	FLUSH PULL	D89 x 32D	ROCKWOOD
1 ea	O.H. STOP	9-XXX-652	RIXSON
3 ea	SILENCERS	609	ROCKWOOD

OBTAIN KEYWAY AND KEYING INFORMATION FROM MIKE JONES

HEADING 2
DOORS:

EACH TO RECEIVE:

3 EA	HINGES	T4A3786-4.5 x 4.5 x 26D	MCKINNEY
1 EA	STORAGE	AUR8805FL-626	YALE
1 EA	CLOSER	4400-REG x 689	YALE
1 EA	ELECTRIC STRIKE	1006 X 630	HES
1 EA	ACCESSORY	2005 SMART PAC	HES
1 EA	KICKPLATE	K1050-10” x 2”LDW x B4E x CSK x 32D	ROCKWOOD
1 EA	WIRE HARNESS	QC-1500P / QC-1500	MCKINNEY
1 EA	POWER SUPPLY	BPS 24-1	SECURITRON
1 EA	WALL STOP	409 X 32D	
3 EA	SILENCERS	608	ROCKWOOD

NOTES: CARD READER TO BE PROVIDED BY OWNER. KEYING SHALL MATCH BUILDINGS EXISTING SYSTEM. OBTAIN KEYWAY AND KEYING INFORMATION FROM MIKE JONES

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

   1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 VINYL COMPOSITION FLOOR TILE (VCT)

A. Products: Subject to compliance with requirements, provide the following:
   1. As indicated on the Drawings.

B. Tile Standard: ASTM F 1066, Class 1, solid-color tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).

F. Colors and Patterns: As indicated on the Drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

   1. Adhesives shall comply with the following limits for VOC content:

      a. Vinyl Composition Tile Adhesives: 50 g/L or less.
      b. Rubber Floor Adhesives: 60 g/L or less.

   2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

D. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Products recommended by floor tile manufacturer for resilient terrazzo floor tile.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
    a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply three coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13
TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Carpet tile, accessories and installation.

B. Related Sections include the following:

1. Division 09 Section "Contoured Resilient Millwork Base" for resilient wall base and accessories installed with carpet tile.
2. Flooring Transition Schedule for transitions between the various flooring systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Samples.
2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.

D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

E. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 01. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification as standard with the product specified in the Finish Schedule Legend, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in the Finish Schedule Legend establish requirements for product quality in terms of appearance, construction, and performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period for Tile Carpeting: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 15 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Product: Subject to compliance with requirements, products that may be incorporated into the Work shall be those listed in the Materials Legend or an approved equal by the Architect.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.

3.2 PRE-INSTALLATION REQUIREMENTS

A. Store carpet tile modules in a heated room at a minimum temperature of 68 deg F (20 deg C) at least three days prior to and during installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

C. Clear away debris and scrape up cementitious deposits from concrete surfaces to receive carpet tile; apply sealer to prevent dusting.

D. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

E. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

F. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:

1. Carpet manufacturer.

G. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

H. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Moisture Testing:

a. Test for Relative Humidity: Testing for moisture using a Humidity Probe and Digital Meter (**ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using *in situ* Probes**) will require 3 tests for the first 1,000 sq. ft., and at least one additional test for each 1,000 sq. ft. thereafter. Maximum allowable reading shall be 75% RH.
b. Existing slab on grade as well as elevated slabs (new and existing) must be tested.
c. Testing shall be by a certified testing agency and provide a copy of the report to the Architect.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."

B. Installation Method: Glue-down; install every tile with releasable adhesive.

C. Match carpet tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered.

1. Lay carpet tiles with grain direction alternating in adjacent carpet tiles (basket-weave pattern).

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 90 00
PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Application provisions of Division 01 shall govern work of this Section.

1.2 Title IV of the Lead Based Paint Poisoning Prevention Act:
(12 U.S.C. 1701u) and the implementing regulations in 24 CFR Part 35; Which prohibits the use of lead based paint in structures constructed or rehabilitated with federal assistance.

1.3 WORK INCLUDED

A. This Contractor shall furnish all labor and materials as indicated on the room finish schedule, and as shown on the drawings and/or herein specified as follows:

1. All interior metal that is not copper, aluminum, stainless steel, brass, bronze, chromium plated, or factory finished.

2. CMU wall and new column.

1.4 CONDITIONS OF THE SURFACES

A. On all work, this Contractor is to receive the surface to be painted or otherwise treated by him, free from foreign matter such as concrete, plaster, grease, dust etc., caused by other crafts, and shall be required to do a nominal amount of sanding and cleaning before proceeding with his work.

B. Foreign matter shall be removed by the craft responsible for its presence, and the surface made acceptable to the Painting Contractor and the Architect. If surface is unacceptable the Painting Contractor shall not commence work and shall notify the Architect in writing.

PART 2 – MATERIALS

2.1 All materials to be used under this section of the specifications shall be delivered at the building in the original containers, with labels intact and seals unbroken.

2.2 No materials are to be reduced or changed except as specified by manufacturer of said materials.

2.3 All materials, except as otherwise specified, shall be of the "Best Grade" or "First Line" paint manufactured, approved by the Architect.

2.4 Where ready mixed materials are used, they shall be of any of the following manufacturers, or an approved equal, and of the best grade of materials produced by such manufacturers for the respective purposes for which they are used:

Benjamin Moore	Pratt & Lambert In.
Glidden Company	Cook
DuPont Company	Sherwin-Williams Company
Porter	Tnemec
Conspec	Horncure

PART 3 – EXECUTION

3.1 WORKMANSHIP:

A. All work shall be done by skilled mechanics in a workmanlike manner. All paints must be smoothly and evenly spread on or flowed on, and shall be free from runs, sags, crawling or other defects. All painting shall be done under favorable weather conditions.

3.2 PREPARATION

A. All greasy and oily metal surfaces to be painted shall be cleaned with benzine or mineral spirits before any paint is applied. All galvanized metal surfaces shall be treated with a solution made by adding eight (8) oz. of copper acetate or copper sulfate to one (1) gallon of warm water in an earthenware or glass vessel, or with a proprietary etching liquid, or surfaces may be washed with benzine or mineral spirits, and a coat of zinc oxide, or other standard galvanized primer, red lead.

B. Do not apply exterior paint in damp, rainy weather or until the surface has dried thoroughly from the effect of such weather. Do not apply varnish or paint when temperature is below 50^{O}F.

C. Surface to be stained or painted shall be clean, dry, smooth and adequately protected from dampness. Each coat of paint shall be applied smoothly, worked out evenly and allowed to dry completely before the subsequent coat is applied.

D. Finished work shall be uniform and of the approved color. It shall completely cover, be smooth and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean without overlapping. Where high gloss, enamel is used, lightly sand undercoats to obtain finish coat.

E. At completion, touch up and restore finish where damaged and leave in good condition.

F. Surface Preparation:
Concrete: Allow new concrete to cure for 28 days, Brush-off blast.
Concrete block: Allow mortar to cure for 28 days. Level protrusions and mortar spatter.
All surfaces must be dry and clean.

G. Repair all necessary nail holes, dents, cracks, open joints, and other defects shall be done after the priming or first coat is dry, and before second coat is applied. Sand to a smooth finish. Putty shall be pure linseed oil-white lead whiting, put in color to match the finish coat. At least 24 hours shall be allowed between coats under most favorable conditions. All coats shall be of the proper consistency and well-brushed out.

H. WOOD: NOT USED.

I. STEEL AND IRON: Remove grease, dirt, mud, rust and scale as necessary to receive paint. Touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, it shall be removed by descaling or wire brushing as necessary to produce satisfactory surface for painting.

J. GALVANIZED METAL: Thoroughly clean by wiping surfaces with prefix surface conditioner and primer with cook permagrip galvanized primer.

3.3 RESPONSIBILITY

A. The Painting Contractor shall be held responsible for the finishing of his work in the manner and form prescribed by the Architect.

B. The final coat shall not be applied until all other crafts are finished with their work, their material and debris removed, and the premises turned over to the painting Contractor in broom-clean condition.

3.4 COLOR SAMPLES

A. The finished work shall match samples of colors and finishes, which will be prepared by the Contractor for the Architect's approval. No work of any kind shall be performed until such samples have been approved. Bids shall be based on the use of the specific brands and quality as specified. No substitution shall be made without written approval of the Architect.

B. The colors shall match Sedgwick County Standards.

3.5 STORING

A. A room on the premises shall be assigned to the painting Contractor for the storage of his tools and materials. This Contractor shall properly protect the floor with drop cloths or building paper. All paint shall be mixed in suitable containers. Necessary precautions shall be taken to prevent fire.

3.6 PROTECTION

A. This Contractor shall protect the work of all other trades against damage or injury by his employees, or by his materials, tools or utensils used in connection with this work. Any damage done by him shall be repaired at his own expense.

3.7 COLORS

A. Colors shall be pure, nonfading pigments, finely ground. Colors that are to be used on plaster or cement shall be limeproof. The colors shall match Sedgwick County Standards.

3.8 **INTERIOR METAL:**

First Coat - Metal primer (Not required if factory primed)
Second Coat - Enamel undercoater
Third Coat - Semi-gloss enamel

3.9 **CONCRETE FLOOR:**

Epoxy. To match the county standards.

3.10 **HOLLOW METAL DOOR FRAMES - INTERIOR:**

First Coat - Metal Primer
Second Coat - Metal Paint
Third Coat - Metal Paint
COLOR SHALL MATCH RUBBER BASE

3.11 **CONCRETE BLOCK: (interior-all others except for areas of burnished concrete masonry)**

First Coat - Block filler, tinted.
Second Coat - Latex paint.
Third coat - Latex paint.

3.12 CLEANING AND REMOVAL OF RUBBISH:

A. Upon completion of all work under this Contract, the Contractor shall clean the entire area thoroughly, removing all paint splatters, droppings, etc. and touch up all damaged work to the satisfaction of the Architects. The entire installation shall be thoroughly clean.

END OF SECTION

SECTION 10 80 00
TOILET ACCESSORIES

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 01 shall govern work of this Section.

1.2 SCOPE OF WORK

A. The General contractor shall furnish and deliver to the project all items of toilet accessories hereinafter specified in the plans or specifications or obviously required to complete this part of the contract. Items not specifically mentioned but necessary to complete the work shall be furnished matching in quality and finish the items described or specified.

1.3 SCHEDULE AND SAMPLES

A. A complete schedule of accessories shall be submitted to the architect for his approval. Samples of all items appearing on the schedule shall be submitted to the Owner/Architect for approval prior to ordering.

1.4 DELIVERY

A. The General Contractor shall receive and check and be responsible for all accessories delivered to the job site. All accessories shall be properly stored until ready for application and shall be protected against damage to finish or operation after application. Installation shall be in strict accordance to the factory instructions and all accessories shall be in proper working order and adjustment upon completion of installation.

1.5 GENERAL REQUIREMENTS

A. The accessories contractor shall check accessories hardware with details and be responsible for fitting of same. If accessories specified will not fit properly, he shall notify the architect or owner so that adjustment can be made before accessories are ordered.

PART 2 – PRODUCTS

2.1 TOILET ACCESSORIES

A. Manufacturer shall be equal to Gamco, Bradley, James River Corporation, Impact Products or the approved equal. <u>All Owner Provided equipment shall be installed by the General C</u>ontractor.

B. G.C TO PROVIDE AND INSTALL THE FOLLOWING:

1. Grab Bars (1) 36”x1-1/2” O.D. Stainless Steel Equal To Gamco 150 Series
(1) 42”x1-1/2” O.D. Stainless Steel Equal To Gamco 150 Series

END OF SECTION

SECTION 11 19 00
DETENTION EQUIPMENT GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes the general requirements for the detention equipment system shown on the Drawings and specified herein. Included are the following topics:

B. The Contractor performing work under Section 11 19 00 shall be referred to in this specification and on the Drawings as the DEC (Detention Equipment Contractor).

C. The work performed by the DEC under specification Section 11 19 00 includes the following:
1. Section 11 19 10 – Detention Hollow Metal Doors and Frames
2. Section 11 19 20 – Detention Hardware
3. Section 11 20 00 – Security Fasteners

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 04100 – Unit Masonry Assemblies

C. Section 07 92 00 – Security Sealants

D. Section 09900 – Painting

E. Section 11 20 00 – Security Fasteners

F. Section 26 05 00 – General Electrical Provisions

G. Section 28 46 00 – Security System General Requirements

1.3 BIDDER QUALIFICATIONS

A. Bidders shall assign a project manager as the sole responsible contact for coordination purposes for the duration of the project. The project manager shall have at least 5 years experience in detention construction, and be a technically qualified full time employee of the bidding contractor.

B. Bidders must have the capability to provide equipment in full and strict compliance of provisions of this specification. It is mandatory that the minimum given specifications be strictly adhered to, so as to provide a high level of quality to the design objectives. There shall be no substitutions allowed that have not been pre-approved by addendum.

C. Bidders shall have access to necessary equipment, organizational capacity and technical competence to perform work properly and expeditiously.

D. Bidders shall employ qualified, experienced, factory trained installers to perform the work. The A/E reserves the right to contact specified manufacturers and confirm that the bidder is an established and authorized reseller of detention equipment.

E. It is essential that bidders have an established record of successfully completed projects. The criteria used to evaluate whether a project has been successfully completed includes:
   1. Contracts completed in accordance with plans and specifications.
   2. Work completed within the time constraints of the project.
   3. Fulfillment of guarantee requirements as specified in the contract documents.

F. A single bidder shall perform the work of this Section. This Contractor shall be regularly engaged in the installation and service of detention equipment including, but not limited to, equipment listed in Sections 11191 thru 11197.

1.4 ACCEPTABLE DEC CONTRACTORS

A. In order to be pre-approved as a Detention Equipment Contractor on this project, prospective DEC contractors had to score 75% or higher on the previous contractor pre-qualification submission. Those DEC contractors with scores of 75% or higher include:

1. **CCC Group, Inc.**
   5797 Dietrich Road
   San Antonio, TX 78219
   (210)662-1642
   Attn: Randy DeMent

2. **Cornerstone Detention Products, Inc.**
   25270 Will McComb Drive
   Tanner, AL 35671
   (256)355-2396
   Attn: Heath Claborn

3. **Southern Folger Detention Equipment Company**
   4634 S. Presa
   San Antonio, TX 78223
   (210)533-1231
   Attn: Jim Brown

4. **Stronghold Industries**
   2000 Oakes Road
   Racine, WI 53406
   (262)770-2688
   Attn: Tom Ackley

5. **Sweeper Metal Fabricators**
   Drawer 672
   Drumright, OK 74030
   (918)352-9180
   Attn: Jessica Ryker

B. Any bid from a Prime Contractor that does not include the name of a pre-qualified DEC in the appropriate space provided on the Bid Form will be automatically rejected.

C. The pre-approval process for DEC contractors is complete. Additional prospective DEC contractors will no longer be considered.

1.5 UNLOADING AND STORAGE OF MATERIALS

A. The DEC shall be responsible for receiving, unloading, storage and distribution of detention equipment as specified.

B. It will be the responsibility the DEC to coordinate delivery times and handling arrangements. It will also be the responsibility of the DEC to acquire the necessary dry, secure, lockable storage space required for their materials. Materials shall be protected from moisture, condensation, temperature change, exposure to sun, and other means of potential damage.

C. Do not store products on or in the structure in a manner that might cause distortion or damage to the products or the supporting structure.

D. The DEC shall repair or replace materials damaged during handling, shipment, storage, distribution or installation without additional cost or time impact to the project. Damaged materials will be repaired or replaced in an expeditious manner so as not to effect the project schedule or the work of other trades.

1.6 SERVICE REQUIREMENTS

A. The DEC shall show satisfactory evidence, upon request, that they maintain a fully equipped local service organization capable of furnishing adequate inspection and service to the equipment, including replacement parts. The service organization shall be capable of a minimum 8 hour on site response time. The service organization shall produce evidence that they have a fully experienced and established business for at least 5 years and proven satisfactory installations during that time. The DEC shall be prepared to offer a service contract for the maintenance of the systems upon expiration of the specified period of guarantee.

B. On-site service, parts and labor are to be provided at no cost to the Owner, for a period of 12 months from the date of final acceptance.

C. The DEC shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of equipment.

1.7 SUBMITTALS

A. Shop drawings shall be submitted for approval prior to ordering any equipment in accordance with Division 01 requirements. One complete set of drawings shall be submitted in electronic format as outlined herein.

1.8 SUBMITTAL REQUIRMENTS

A. The DEC shall submit shop drawings for products in their scope of work in a composite submittal format. Submittals will not be deemed complete unless they contain the following components in their entirety:

1. SECTION 11 19 10 - DETENTION HOLLOW METAL DOORS AND FRAMES
    a. Detention Door and Frame Shop Drawings
    b. Detention Hollow Metal Installation and Storage Instructions
    c. Manufacturer's letter of "UC" certification
    d. Frame Mounted Security Electronics Templates
    e. Load and Impact Test Reports
2. SECTION 11 19 20 - DETENTION HARDWARE
    a. Detention Hardware Schedule
    b. Detention Sliding Device Shop Drawings

c. Detention Hardware Catalog Cuts
d. Detention Hardware Templates
e. Detention Hardware Wiring Diagrams

B. The DEC shall complete submittals within 6 weeks from the date they receive notice to proceed.

C. Upon receipt, the A/E will make a determination whether submittals are complete. Once submittals have been declared complete a meeting will be scheduled to perform a comprehensive submittal review. Unless excused by the A/E, representatives from the following firms shall be present for the duration of the submittal review meeting:
1. Architect
2. General Contractor
3. Owner's Representative
4. Detention Equipment Consultant
5. Masonry Contractor
6. Electrical Contractor
7. Detention Equipment Contractor
8. Security Electronics Contractor
9. Detention Hollow Metal Door and Frame Manufacturer

D. The submittal review meeting shall be held at the Architect's office, General Contractor's office, jobsite or a location to be determined. All parties are responsible for their own travel costs and expenses to, from and for the duration of the meeting. The meeting will require time as necessary to complete, but shall not exceed 3 business days in length.

E. It will be the responsibility of the Architect to schedule the review meeting within 4 weeks from the date submittals are deemed complete.

1.9 OPERATION AND MAINTENANCE MANUALS

A. The DEC shall provide 3 complete sets, in hard cover binders, of maintenance and operating instructions of products specified in Section 11 19 20. Include as built drawings of the detention keying plans with a detailed schematic chart of the detention keying system showing all levels of change and master keying assigned to the project. Manuals shall also include a material guide that contains the replacement part numbers and description of all components used.

B. Submit operation and maintenance manuals to the Architect and Owner for review, comment and approval. Promptly make any necessary corrections and submit final copies for Owner use.

C. See Division 01 for additional requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT STANDARDS

A. A complete detention equipment system consisting of all the individual equipment shown and specified is required. These are largely functional specifications in order to maintain competitive bidding; however, it is expected that the minimum given specification requirements be strictly adhered to so as to provide a high level of quality with the design objectives. Equivalent manufacturers and products shall be in strict accordance with this specification.

B. It is the responsibility of the DEC to verify the completeness of the Drawings, Specifications and Schedules and the suitability of devices to meet the intent of the specifications. Any additional equipment, accessories or incidentals required, whether or not specifically mentioned herein, shall be provided by the Contractor without claim for additional payment, it being understood that a complete detention equipment system is required.

C. Materials and equipment shall be new and unused. Unless specifically approved by the A/E, materials and equipment in the system shall be the standard design or model ordinarily supplied as a product item by manufacturers regularly engaged in the production of such equipment. They shall be the manufacturer's latest standard designs current at the time of delivery, modified only to the extent necessary to comply with the requirements of these specifications. Where two or more units of the same class of equipment are required, such units shall be the standard products of a single manufacturer. Manufacturers shall be established in the industry so that prompt and continued service and delivery of spare parts may be assured.

D. Temperature Ratings: Indoor components in heated areas shall be capable of full operation in relative humidity up to 90% and temperatures from 35° F. to 120° F. Outdoor components shall be capable of full operation in humidity up to 100% and temperatures from -30°F. to 120°F.

E. Fasteners for detention hardware, lock coverplates, removable glass stops, etc. shall be TORX® security type compatible with those specified in Section 11200 - Security Fasteners.

F. Components that comprise the various systems shall be UL listed where a UL listing exists for that component.

2.2 CABLING AND TERMINATIONS

A. The Division 26 Electrical Contractor is responsible for providing and installing Conduit, wire, cable, cable tray, junction boxes, pull boxes, and termination of field devices and head end equipment. Cabling, wiring and terminations shall be in conduit in accordance with Division 26.

B. Cabling shall be continuous and shall not be spliced between the field-mounted device and the receiving equipment. Door wiring shall be run from the door to the control panel without splices.

C. The DEC shall furnish and install factory pre-wired loom (wire harness) for the detention sliding door device system of Section 11 19 20. Wiring harnesses to be installed in the cable tray located in the overhead housing of the detention sliding door device system. Terminations shall be performed by the Division 26 Contractor.

D. System wiring shall be color coded with labeling and coding in accord with submitted and approved wiring diagrams. Color coding and tagging shall be maintained throughout the system at accessible locations to the cabling.

PART 3 - EXECUTION

3.1 ON-SITE COORDINATION

A. The DEC shall make periodic visits to the site to review the work of other trades as it relates to the installation of the detention equipment. The coordination shall included, but not be limited to, the following:

1. Examine the areas and conditions under which installation is to occur and document conditions detrimental to the proper and timely completion of the work. Installation should not proceed until unsatisfactory conditions have been corrected.
2. Prior to installation, meet at the project site to review products, installation methods, and any procedures required to perform the work.
3. Install products without damage to the work of other trades. Adjacent surfaces shall be protected from damage and staining during installation.
4. Furnish and install appropriate anchors to complete the work. Coordinate with other trades where necessary to make the necessary provisions for proper installation.
5. Furnish setting drawings, diagrams, templates, and installation instructions for products.
6. Coordinate timing and distribution of materials so that distributed materials do not effect the work of other trades.
7. Coordinate proper locations of rough-in requirements and service connections with other trades.

B. The DEC shall visit the site once every other month until mobilized on-site for installation and system start-up. A report will be provided for each visit describing the work in progress, the work completed to date and the work to remain. The report shall also include a description of any changes that were discussed or directions given to the Masonry Contractor, Electrical Contractor or Security Electronics Contractor. The report will include any work that does not conform to DEC installation requirements. This report shall be forwarded to the construction team (Architect, General Contractor, and the Detention Equipment Consultant.

3.2 PROJECT CLOSEOUT

A. The DEC shall make themselves readily available during the final systems checkout performed by the Division 17 Security Electronics Contractor at the end of the project. The DEC shall promptly adjust and repair problems deemed to be mechanical.

B. The DEC shall include all costs in their bid for a full-time presence on site during the first week of start-up after Owner occupancy. This requirement shall include a minimum of five 8-hour days for 1 technician. The purpose of this requirement is for trouble shooting and training that occurs during the first full week of occupancy once the detention equipment system is fully exercised.

3.3 INSTALLATION

A. Securely place products in locations required. Install in alignment, free from warp, twist or distortion, plumb, level and true. Comply with approved shop drawings, manufacturer's instructions and recommendations for both handling and installation of the products for particular conditions of installation in each case, except where more stringent requirements are indicated or specified, or where project conditions require extra precautions or provisions for satisfactory performance of work. Where printed instructions are not available or do not apply to project conditions, consult

manufacturer's technical representative for specific recommendations before proceeding. Do not install products which are observed to be defective.

B. Perform cutting, drilling and fitting required for installation of detention equipment.

C. Set work accurately in location, alignment and elevation, measured from established lines and levels with lines visually parallel.

D. Cut necessary holes for installation or other work in detention equipment; comply with templates or detail drawings furnished by other trades prior to fabrication and installation of detention work.

E. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work. Exposed plug welds shall be 1/8 inch minimum at 3/8-inch diameter holes equally and evenly spaced no greater than 8 inches on center. Exposed fillet (stitch) welds shall be 1/8 inch minimum, 1 inch long (minimum length) evenly spaced not greater than 12 inches on center. Field welding required for the installation of detention equipment shall be in accord with the recommendations of the detention equipment manufacturer. Where surfaces are to be exposed to view, grind and sand welds smooth; finish holes, defects, other imperfections so surfaces will be smooth when painted. Fill spaces between welds with metal body putty filler at all metal to metal joints. Metal to metal joints shall be completely filled and shall contain no cracks or seams that can be used for passage or storage of contraband. Use of security sealant in lieu of metal body putty filler prohibited.

F. Security sealants at metal to masonry/concrete joints will be the responsibility of the Section 07700 contractor.

G. Clean and touch up any scratches or paint damage that occurs during installation with primer prior to finish painting.

3.4 ADJUSTMENT AND REPAIR

A. Before final connections to electrical power are made, test electrically operating or sensing items and adjust as required to provide proper functions. Test electrically controlled doors utilizing the control consoles under normal operating procedures.

B. Adjust and lubricate moving parts to operate smoothly and quietly, without binding.

C. Work shall be free from scratches, dents, permanent discolorations and other defects; remove and replace damaged parts, surfaces with imperfections or damage during installation or thereafter before time of final project acceptance. Prior to touch-up painting, remove foreign material from metal surfaces including connections. Touch-up welds, bolted connections, and abraded/damaged areas in shop applied metal primer paint.

3.5 PROTECTION AND CLEANING

A. During installation, protect adjacent surfaces and detention equipment from damage. Work shall be free from scratches, dents, permanent discolorations and other defects. Remove and replace damaged parts and surfaces imperfections prior to Owner occupancy.

B. It is the responsibility of the DEC to make any necessary recommendations to the General Contractor to protect completed work. The DEC shall make regular site

inspections and immediately advise the General Contractor of any potential hazards that may damage completed work. It shall be the expressed interest of the DEC to provide the greatest degree of assurance possible that goods and services provided are not damaged prior to Owner occupancy.

C. Maintain storage and work areas in a neat and orderly condition during construction.

D. Remove non-permanent labels and non-permanent protective coatings. Thoroughly clean surfaces, including concealed work, in accord with manufacturer's instructions. Remove foreign materials prior to inspections and project closeout.

3.6 MAINTENANCE AND OTHER MANUALS

A. The DEC shall maintain a file specific to this project which shall include all detention equipment manuals, approved shop drawings, manufacturer's maintenance instructions, and other pertinent information. This file shall be maintained for a period of time consistent with the length of time the equipment provided is in actual service. Documents shall be of such a nature that they may be reproduced to replace similar documents in possession of the Owner.

3.7 TRAINING

A. The DEC shall conduct group and/or individual training sessions, as required by the Owner, for the proper operation and maintenance of all detention systems outlined in this Section. Training shall be conducted by a representative that is knowledgeable in operation of detention equipment, its mechanisms and operation. Representative must be capable of training personnel in the adjustment and operation of detention equipment including pertinent safety requirements, and be able to instruct maintenance personnel in its operation, upkeep and repair.

B. The DEC shall provide a minimum 24 hours of training time. Training sessions shall be arranged with the Owner's representative and shall include 3 training sessions at 8 hours each. Training session to be video taped. Provide 1 copy of the video taped training session to the Owner upon completion.

C. Topics to be discussed during training session shall include, but are not limited to:
1. Detention Door Hardware
2. Operation and Maintenance Manuals

D. The DEC shall arrange for additional training to take place at the lock manufacturer's training facility. This training shall not exceed 5 days in length and shall be attended by 1 staff member as selected by the Owner. It will be the responsibility of the DEC to make necessary travel arrangements including the costs of travel, food, lodging and registration. Expenses for additional staff members will be paid by the Owner.

3.8 GUARANTIES

A. The DEC shall warrant materials furnished and installed in their respective bid sections to be free from defects in materials and workmanship for a period of 1 year from the date of Substantial Completion as indicated in the Conditions of the Contract. In addition to the requirements listed in the Conditions of the Contract the DEC shall extend the correctional period for 1 additional year.

B. Material which has been misused, abused or neglected by the Owner, defects for damage caused by work or failure of work by others; ordinary wear and tear; or normal

equipment adjustment which are within the Owner's operation and maintenance responsibility will not be covered by the warranty.

C. Any unauthorized modifications, repairs or tampering shall constitute termination of this guaranty.

3.9 PREVENTATIVE SERVICE CALLS

A. During the period of guarantee, the DEC shall provide 2 preventative service calls by qualified personnel at no additional cost to the Owner. Calls shall consist of at least 8 hours on site performing routine inspection and maintenance service. Calls shall be arranged with the Owner at least 2 weeks prior to the scheduled visit. These preventative service calls shall be in addition to any other time required for maintenance or service during the period of guarantee.

B. The first preventative service call shall occur 3 months after the date of Substantial Completion. The final preventative service call shall occur 9 months thereafter. Any required lubrication or adjustments shall be performed in the presence of Owner's maintenance personnel so they can learn the techniques used for routine service and maintenance.

END OF SECTION

SECTION 11 19 10
DETENTION HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes all labor, materials, equipment and services to provide a complete detention hollow metal door and frame system as shown on the Drawings and specified herein.

1.2 SUMMARY OF WORK

A. It will be the responsibility of the DEC to install all detention hollow metal doors.

B. It will be the responsibility of the DEC to install detention hollow metal frames in precast concrete and existing masonry partitions.

C. It will be the responsibility of the Division 04 – Masonry Contractor to install detention hollow metal frames in new masonry partitions.

D. It will be the responsibility of the Division 04 – Masonry Contractor to grout detention hollow metal frames in precast concrete partitions and masonry partitions.

E. It will be the responsibility of the DEC to weld and finish detention frame grout plugs.

1.3 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 07 92 00 – Security Sealants

C. Section 09900 – Painting

D. Section 11 19 00 – Detention Equipment General Requirements

E. Section 11 20 00 – Security Fasteners

F. Section 26 05 00 – General Electrical Provisions

G. Section 28 46 00 – Security System General Requirements

1.4 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification section 11 19 00 and include the following information:
   1. Manufacturers shop drawing submittal. Drawings shall include, but are not limited to, schedule of openings, door and frame elevations, sections, glazing and anchor details. Shop drawings shall include details of lock pockets, door position switches, and rough in for any frame mounted security electronic components. Shop drawings shall clearly distinguish between factory installed conduits, and conduit required by others. Shop drawings that do not conform to the above minimum requirements will be deemed incomplete.
   2. Submit detention hollow metal installation and storage instructions. Reference NAAMM standard HMMA 840-99 for completeness.

3. Provide a manufacturer's "UC" (Underwriters Construction) letter of certification for any door and frame assembly NOT able to receive a physical fire label. Letter must state why the hollow metal assembly could not be fire rated. The letter shall state that although the assembly will not bear a physical fire label due to the reason listed, the procedures, quality and standards used during fabrication will be the same as those used for fabrication of a fire rated opening.
4. Submit templates of frame mounted security electronics devices with shop drawings or product data sheets of electrical back boxes. Submittal must include shop drawings of each different variation of frame mounted Security Electronics configuration for review of locations and mounting heights.
5. Submit copies of an independent testing laboratory reports certifying the following minimum performance requirements. Testing shall be in accord with ASTM F1450-97 and NAAMM standard HMMA 863-04. Testing of removable glass stops in accord with ASTM F1592-95A:
    a. Static Load Test
        1) Under a centrally applied load of 14,000 pounds at quarter points the maximum permitted deflection is no greater than 0.58 inch with a rebound of not to exceed 0.15 inch after release of load.
    b. Rack Load Test
        1) Under a concentrated load of 7,500 pounds on one unsupported corner of a door the maximum defection shall not exceed 3.5 inches without failure.
    c. Door Impact Test
        1) Under a battering attack of 200 foot pound impacts applied to the stop side of the door by a steel pendulum, detention door remains closed during the test and be fully operational upon completion.
    d. Edge Crush Test
        1) Under an applied load of 8,000 pounds applied to the midpoint on the hinge edge of the door, the maximum deflection shall not exceed 0.25" without failure.
    e. Removable Glass Stop Test
        1) Under a battering attack of 200 foot pound impacts with a steel pendulum applied to the fixed stop side of steel plate glazed borrowed light, glazing stops remain in place and not more than one screw is broken upon completion.

1.5 QUALITY ASSURANCE

A. Materials under this specification shall be provided by one of the manufacturers listed. Detention hollow metal doors and frames by other manufacturers may be considered upon written approval of the Architect. Requests for substitution shall include all pertinent technical data, descriptive product literature, and product specifications and must be received at least 7 days prior to the bid date or the date of the last published addendum, whichever is earlier.

B. Prospective manufacturers shall be able to furnish materials that meet or exceed the requirements of this specification. Manufacturers must be in good financial standing, and able to demonstrate that they have been actively engaged in the manufacturing of detention hollow metal doors and frames for a minimum of 5 years.

C. Upon receipt of request for substitution, the A/E will make an investigation to determine the ability of the manufacturer to perform the work. The A/E reserves the right to request additional information as deemed necessary for the determination process. Upon approval, the prospective manufacturer will be listed by addendum.

D. Detention doors and frames must be fabricated by the same manufacturer.

E. Approved manufacturers of detention hollow metal doors and frames:
   1. American Steel Products – Swainsboro, GA
   2. Apex Industries – Moncton, NB Canada
   3. Chief Industries – Grand Island, NE
   4. Habersham Security Metal Products – Cornelia, GA
   5. Steel Door Industries – Hartselle, AL
   6. Trussbilt – New Brighton, MN
   7. Willo Products Company – Decatur, Alabama

PART 2 - PRODUCTS

2.1 DETENTION HOLLOW METAL DOORS

A. Provide a complete detention metal door system as detailed on the Drawings.

B. Interior detention hollow metal doors shall be factory formed with 12 gauge mild steel face sheets both sides. Exterior detention hollow metal doors shall be factory formed with 12 gauge minimum A60 galvannealed face sheets. Detention hollow metal doors in high humidity areas shall be fabricated with 12 gauge 304L stainless steel face sheets.

C. Doors shall be internally reinforced with one of the following systems:
   1. Continuous steel truss design core material, 28 gauge minimum, having truncated triangular sections extending continuously from one door face to the other, spot welded to each face 2-3/4" o.c. horizontally and 3" o.c. vertically. Core material to extend full height and width of door.
   2. Continuous vertical hat sections, one such hat section welded to each face of the panel, 16 gauge with vertical webs no more than 4 in. apart. Hat sections shall be welded to each other at least 6 in. o.c. both sides in order to prevent separation.

D. All voids between stiffeners shall be completely filled with fiberglass or mineral rock wool batt-type material.

E. Door edges shall be provided with additional reinforcing to prevent prying or compression attacks on the door edge. The thickness of the door edge, including reinforcing, shall not be less than 5/32”. Weld reinforcing securely to the door edge. Seams shall be fully welded, leaving a visible smooth, continuous weld at the edge of the door.

F. Top and bottom of the door shall be closed with 12 gauge perimeter reinforcing. Top and bottom closing channels shall be welded to the edge reinforcing. Top and bottom of doors shall be finished flush with an additional inverted channel of not less than 14 gauge.

G. Hinge reinforcement shall be minimum 3/16” thick, 1-1/2” wide and 10” long. Reinforcements shall be securely welded to the door edge. In addition, a backup stiffener channel not less than 14 gauge shall be welded to each hinge reinforcing and to each door face, to prevent rocking failure of the hinge reinforcing.

H. Swing door edges shall be beveled 1/8" in 2". Sliding doors shall have a square edge.

I. Doors shall be reinforced, drilled, tapped and prepared for mortised hardware in accordance with the final approved hardware schedule and templates. Doors shall be reinforced only for surface applied hardware. Reinforcing shall be as follows:
   1. Surface Mounted Hinges – 3/8’ minimum

2. Mortised Hinges and Pivots – 3/16” minimum
3. Internal Reinforcing for Other Hardware – 12 gauge minimum

J. Glass Stops shall be provided to secure glazing. Fixed glass stops shall not be less than 12 gauge and shall be spot welded to both face sheets 5.0 in. o.c. minimum. Removable glass stops shall be constructed of 1-1/4” x 1-1/4” x 12 gauge angle. Angle stops shall be mitered or notched, fit tightly at the corner joints, and secured in place using 1/4 – 20 or 1/4 – 28 button head, pin TORX®, six point, tamper-resistant machine screws 2” from each end 8” o.c. max. Glass pockets shall be oversized 1/4” to allow for 1/8” thick glazing tape each side of glass.

K. Food Pass/Cuff Port Openings - The food pass opening shall be fabricated using 10 gauge interior channels welded securely to the inside of both face sheets. Reinforcing for food pass locks and hinges shall consist of 10 gauge channel. The clear opening shall be as shown on the architectural drawings. The four corner seams shall be continuously welded. The food pass shutter shall consist of a 10 gauge door with a 1/4” backplate. The overall shutter size shall overlap the opening by 1/2" minimum on all four sides. Fluids entering the food pass shall not be allowed to seep down into the door construction. Fill any voids at metal to metal joints at the bottom of the food pass with metal body putty filler.

L. Door Undercuts
1. Swing doors without thresholds – 3/4"
2. Swing doors with thresholds – 1/8” clearance bottom of door to top of threshold
3. Sliding doors – as dictated by sliding device manufacturer

M. If directed by the Architect, the erector shall destroy a randomly selected detention hollow metal door by sawing it in half. If examination discloses a door construction other than that which is specified, the door manufacturer shall replace all doors shipped to the project with doors constructed in compliance with this Specification. All costs associated with replacement shall be bore by the detention hollow metal door and frame manufacturer.

2.2 DETENTION HOLLOW METAL FRAMES

A. Provide a complete detention metal frame system as detailed on the Drawings.

B. Interior detention hollow metal frames shall be factory formed from 12 gauge mild steel. All frames scheduled to receive bullet resistant glazing shall be factory formed from 10 gauge mild steel. Exterior detention hollow metal frames shall be factory formed from 12 gauge A60 galvannealed steel. Detention hollow metal frames in high humidity areas shall be fabricated from 12 gauge 304L stainless steel.

C. Frames shall be straight, neat in appearance, and free of warpage and buckling. Edge bends shall be straight and true. All frame joints shall be welded, except when overall size of frame prohibits shipment. In such cases appropriate frame splices shall be provided for erection in the field.

D. Jamb, head and sill profiles shall be as shown in architectural Drawings. Formed stop height for doors shall be 5/8”.

E. All door frames shall be prepped to receive door silencers. Single doors shall be prepped to receive 3 silencers per jamb. Double doors prepped to receive 2 silencers per jamb. Provide protection to keep holes clear during construction. Provide Glynn-Johnson GJ64 door silencers or equal.

F. Frames that receive glazing shall utilize a double angle jamb profile as detailed. Overall glass stop height shall be 1-1/4". Removable glazing stops shall be constructed of 1-1/4" x 1-1/4" x 12 gauge angle. Protect inside of frame to assure complete screw penetration when frame is grouted full. Protect screws with plastic cups, mortar boxes or Styrofoam blocks as required. Stops shall be mitered or notched, fit tightly at the corner joints, and secured in place with Phillips head machine screws for shipment. Provide 1/4 – 20 or 1/4 – 28 button head, pin TORX®, six point, tamper-resistant replacement screws for final glass installation. Security screws are required 2" from each end and 8" o.c. max. Glass pockets shall be oversized 1/4" to allow for 1/8" thick glazing tape each side of glass.

G. Corner joints shall have contact edges closed tight with faces mitered and stops butted or mitered. Corner joints shall be continuously welded. The use of gussets or splice plates is unacceptable.

H. Frames for multiple openings shall have mullion members with closed tubular shapes conforming to profiles shown on drawings and no visible seams or joints.

I. Hinge reinforcement shall be a minimum of 3/16" thick, 1-1/2" wide and 10" long. Reinforcements shall be securely welded to the frame. The top hinge shall be additionally reinforced with a 3/16" thick back-up angle welded to the hinge reinforcing and frame face.

J. Frames shall be reinforced, drilled, tapped and prepared for mortised hardware in accordance with the final approved hardware schedule and templates. Frames shall be reinforced only for surface applied hardware. Reinforcing shall be as follows:

1.	Lock Bolt Opening Backup	12 gauge minimum
2.	Surface Mount Closers	12 gauge minimum
3.	Concealed Closers	3/16" minimum
4.	Strike Mounting Clips	3/16" minimum

K. Prepare frames to receive electric locks, hardware and electronic security components as scheduled. Provide all concealed conduits routed to the top or bottom of the frame as required. Provide a pull box with removable access plate at the bottom of the frame when concealed conduit is routed to the floor. When electric locks are used in conjunction with door position switches it is the responsibility of the detention hollow metal manufacturer to provide the conduit between the lock box and the door position switch. Provide all electrical boxes required for frame mounted electronic security components. All conduits furnished and installed by the detention hollow metal manufacturer shall be 3/4" IMC.

L. Provide 12 gauge floor clips welded in place at the bottom of each jamb. Floor clips shall have two 7/16" diameter holes for anchoring to floor. Provide adjustable floor clips if scheduled.

M. Provide wire loop anchors for each jamb mounted in masonry. Loops shall consist of 1/4" diameter smooth bar welded to a 10 gauge anchor tab with holes for bar reinforcement. In the installed position the loop shall extend 6" minimum from the throat of the frame. Provide sufficient anchors to permit maximum spacing between anchors of 16". Openings scheduled to receive fire ratings, shall be provided with anchors of type, size and spacing that comply with UL fire rating requirements.

N. Provide grout holes with plugs for frames installed in existing concrete or masonry openings. Grout guards of not less than 24 gauge steel shall be welded in place to protect all mortised hardware. Grout guards for closers shall be 18 gauge minimum.

O. All frames shall be provided with two temporary steel spreaders welded to the base of the jambs to serve as bracing during shipping and handling. Spreaders are for shipping purposes only. Frame installer shall remove spreaders prior to installation. Frame spreaders shall NOT be used to determine proper frame tolerance.

2.3 FINISHES

A. Doors and frames shall receive one coat of the manufacturer's shop epoxyester primer. All material shall be smooth and free of surface blemishes. Prior to painting, all surfaces shall be cleaned of rust, oil, or other impurities to condition the surface of the metal and promote paint adhesion. Prime paint shall be a minimum of 2 mils dry thickness. Frames shall be completely primed prior to the installation of glazing stops. Likewise, glazing stops shall be completely primed prior to installation.

PART 3 - EXECUTION

3.1 COORDINATION

A. The DEC shall verify all dimensions, elevations, and job site conditions before installation begins.

B. The DEC shall make periodic visits to the site to review the work of other trades as it relates to the installation of the detention hollow metal doors and frames.

3.2 UNLOADING, STORAGE AND DISTRIBUTION OF MATERIALS

A. The DEC will be responsible for receiving, unloading and storage of detention hollow metal doors and frames.

B. Detention hollow metal doors and frames shall be stored in accord with NAAMM standard HMMA 840-99.

C. It will be the responsibility of the DEC to distribute detention hollow metal frames to the appropriate floor or designated area of construction staging. It will be the responsibility of the DEC to distribute detention hollow metal doors to each opening.

3.3 INSTALLATION

A. Install detention hollow metal doors and frames true and plumb in accord with NAAMM standard HMMA 840-99 and manufacturer's recommendations.

A. The contractors responsible for setting frames shall provide all expansion anchors, site welding, body putty, filling, sanding and priming required at all frame splices and closure plates. The DEC shall be responsible for welding and finishing of all grout plugs. Field welding of metal to metal joints shall be in accord with manufacturer's recommendations. Exposed welds that occur at frame corners shall start no further than 6 inches above sills. Grind welds smooth and fill spaces between welds with metal body putty filler. All metal to metal joints shall be completely filled and shall contain no cracks or seams that can be used for passage or storage of contraband. Use of security sealant in lieu of metal body putty filler prohibited. All field welds shall be touched up with primer supplied by the detention hollow metal manufacturer.

B. The Division 04 – Masonry Contractor shall grout solid all detention hollow metal frames including intermediate mullions or tubular elements with a strength of at least 14

MPa (2,000 psi) mix or slush solid with mortar during wall construction. Check all grout guards and conduit connections to make sure they have not loosened prior to grouting.

C. The DEC must be present on site at the beginning of detention frame installation to train and coordinate the Division 04 – Masonry Contractor on the proper setting of detention frames.

D. Security sealants at all metal to masonry/concrete joints will the responsibility of the Section 07 70 00 contractor.

E. It will be the responsibility of the DEC to touch up all scratches or paint damage that occurs during installation. Damaged surfaces shall be cleaned and touched up with primer prior to finish painting. The DEC shall use touch up primer provided by the detention hollow metal manufacturer for compatibility with factory applied prime paint. Protection of work in place shall be in accord with Division 01 requirements.

END OF SECTION

SECTION 11 19 20
DETENTION HARDWARE

PART 1 - GENERAL

1.1 SCOPE

A. Provide all labor, equipment, materials and supervision to furnish and install security hardware as shown on the drawings and specified herein.

B. The requirements of specification section 11 19 00 pertain to the work of this Section.

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 11 19 00 - Detention Equipment General Requirements

C. Section 11 19 10 - Detention Hollow Metal Doors and Frames

D. Section 11 20 00 – Security Fasteners

E. Section 26 05 00 – General Electrical Provisions

F. Section 28 46 00 – Security System General Requirements

1.3 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification section 11 19 00 and include the following information:
   1. Detention Hardware Schedule. Provide a detention hardware schedule that contains the following minimum requirements: Schedule of openings, hardware groups, lock types, key sides, side of lock mountings, and lock handings. Hardware schedules that do not conform to the above minimum requirements will be deemed incomplete.
   2. Manufacturer's product data (catalog cuts) for each scheduled hardware item.
   3. Manufacturer's template data for each scheduled hardware item.
   4. Manufacturers wiring diagrams for each scheduled electrical hardware item.
   5. Provide 3 copies of operation and maintenance manuals for all materials specified in this section upon completion of the project. Submit manuals in accord with the requirements of specification section 11 19 00. Include as built drawings of the detention keying system with a schematic chart showing all levels of change and master keying assigned to the project.

1.4 QUALITY ASSURANCE

A. Provide materials specified under this section by one of the manufacturers listed. Detention hardware by other manufacturers may be considered upon written approval of the Architect. Requests for substitution shall include all pertinent technical data, descriptive product literature, and product specifications and must be received at least 7 days prior to the bid date or the date of the last published addendum, whichever is earlier.

B. Prospective manufacturers shall be able to furnish materials that meet or exceed the requirements of this specification. Manufacturers must be in good financial standing,

and able to demonstrate that they have been actively engaged in the manufacturing of detention hardware for a minimum of 10 years.

C. Upon receipt of request for substitution, the A/E will make an investigation to determine the ability of the manufacturer to perform the work. The A/E reserves the right to request additional information as deemed necessary for the determination process. Upon approval, the prospective manufacturer will be listed by addendum.

D. All locks must be provided from a single manufacturer.

1.5 ACCEPTABLE PRE-APPROVED DETENTION LOCK MANUFACTURERS

A. Southern Folger Detention Equipment – San Antonio, TX

B. No known equal.

PART 2 - PRODUCTS

2.1 FRAME MOUNTED ELECTRIC LOCKS

A. Electro-Mechanical 2" Jamb Locks – Solenoid Operated
   1. Manufacturer/Series:
      a. Southern Steel 10300E series or equal
   2. 24VDC solenoid operated.
   3. Internal switches monitor status of bolt to show deadlocked and unlocked conditions.
   4. Bolt throw 3/4" flush when retracted
   5. Mechanical latchback
   6. Galvanized case and cover
   7. Stainless steel roller bolt and latchbolt strike
   8. Standard commercial key cylinder with US26D finish
   9. Standard Functions:
      a. Electric
         1) Remote switch activates solenoid which retracts latchbolt. Latchbolt remains retracted until door is opened approximately 2", then it releases, automatically latches and deadlocks when the door is closed.
      b. Mechanical
         1) Latchbolt is retracted with a builder's hardware key at the door, then it releases and automatically latches and deadlocks when the door is closed.
      c. Emergency
         1) Latchbolt is retracted electrically when switch is in open position and remains retracted indefinitely via continuous-duty solenoid. When the emergency hold open is de-activated, the remote switch is returned to locked position. Latchbolt remains retracted until door is opened approximately 2", then it releases, automatically latches and deadlocks when the door is closed.

B. Electro-Mechanical 2" Jamb Locks – Motor Operated
   1. Manufacturer/Series:
      a. Southern Steel 10300MD series or equal
   2. 24VDC motor operated.
   3. Internal switches monitor status of bolt to show deadlocked and unlocked conditions.
   4. Bolt throw 3/4" flush when retracted

5. Gear motor drive retracts latch against side loads of 600 pounds
6. Mechanical latchback
7. Galvanized case and cover
8. Stainless steel roller bolt and latchbolt strike
9. Standard commercial key cylinder with US26D finish
10. Standard Functions:
    a. Electric
        1) Remote two-position maintained contact switch is required for this function. Latchbolt is retracted electrically when switch is in open position. Div 28 locking control software to initiate 3 second delay at which the remote switch will be triggered to return to locked position. When remote switch is returned to locked position, latch bolt will extend regardless of door position.
    b. Mechanical
        1) Latchbolt is retracted with a builder's hardware key at the door, then it releases and automatically latches and deadlocks when the door is closed.
    c. Emergency
        1) Remote two-position maintained contact switch is required for this function. Div 28 locking control software to initiate emergency hold open feature.
        2) Latchbolt is retracted electrically when switch is in open position and remains retracted indefinitely. When the emergency hold open is de-activated, the remote switch is returned to the locked position, latchbolt will extend regardless of door position.

2.2 DOOR MOUNTED MORTISE LOCKS

A. Mortised Door Locks
1. Manufacturer/Series:
    a. Folger Adam 110
    b. No known equal
2. Mortised into door.
3. Pin tumbler mogul key cylinder with US26D finish
4. Lever handles active or inactive as scheduled.
5. Stainless steel latchbolt, deadbolt, and deadlock actuator.
6. Provide keeper as scheduled
7. Functions: Provide as designated in the detention hardware schedule.
8. Slam Lock
    a. Levers both sides always rigid
    b. Latchbolt operated by key one side or both sides as scheduled
    c. Deadlock actuator
9. Deadlock
    a. Deadbolt operated by key one side or both sides as scheduled
10. Passage Set
    a. Latchbolt operated by lever either side or safety knob as scheduled. Provide solid brass, conical shaped safety knob. Safety knobs to be secured to door by means of 2 thru-bolts. Exposed set screws at safety knob shall not be permitted.

2.3 DOOR MONITOR AND CONTROL

A. Overhead Concealed Closer with Door Position Switch
1. Manufacturer/Series:
    a. LCN 2210-DPS
    b. Norton 7970-DPS

2. Fully hydraulic
3. Full rack and pinion with cast iron cylinder.
4. Separate adjustments for latch speed, general speed and back-check.
5. Door position switch
6. TORX® security mounting screws
7. Aluminum powder coated finish

B. Magnetic Door Position Switch
   1. Manufacturer/Series:
      a. Southern Steel 200MRS-TB
      b. R.R. Brink 201020
      c. Sentrol 2767
   2. Built-in door indicator switch/magnetic reed switch
   3. Actuated magnet recessed into the door edge
   4. Switch unit recessed into the door frame
   5. 24VDC electrical requirement
   6. Triple biased

C. Keeper Switch - Deadlatch
   1. Manufacturer/Series:
      a. Southern Steel 500-CL series or equal
   2. Switch to monitor bolt position

D. Local Electric Key Switch
   1. Manufacturer/Series:
      a. Southern Steel 936 series or equal
   2. 15 amp rating
   3. Mogul key cylinder as scheduled.
      a. Provide key switches that are separately mounted and not integral to the lock. Local LED indication lights are not required. Key switches should be fabricated by the same manufacturer as detention locks.
      b. Provide custom electrical box for wall mounted applications. All wall mounted key switches to be flush mounted in masonry or pre-cast concrete walls as scheduled.
   4. Swing Doors:
      a. Two position, momentary contact, spring return to center
      b. Insert key, turn to right, door unlocks, key returns to center and is removed

E. Push Button / Call Button
   1. Manufacturer/Series:
      a. Folger Adam IPB-1
      b. Southern Steel 906
      c. R.R. Brink 201028
      d. Air Teq 6300
   2. Provide push buttons that are separately mounted and not integral to the lock.
      a. Push buttons shall be momentary contact.
      b. Faceplate US26D finish.
      c. Provide custom electrical box for wall mounted applications. All wall mounted key switches to be flush mounted in masonry or pre-cast concrete walls as scheduled.

2.4 DOOR HARDWARE

A. Full Mortise Hinge
   1. Manufacturer/Series:
      a. Southern Steel 204FMSS
      b. Portland Hardware PH 745 SSC ST

2. 4-1/2" x 4-1/2" x 3/16"
3. Cast stainless steel hinge leafs and hinge pin
4. Drilled and countersunk for TORX® security mounting screws
5. US32D finish
6. Shall meet performance requirements for Grade 1 impact and cycle test according to ASTM F1758-96 Standard Test Method for Detention Hinges Used on Detention Grade Swinging Doors.
7. Provide 4 hinges per door up to 84" in height and one extra hinge for each additional 24" of height or fraction thereof.
8. Provide 4 hinges per door up to 38" in width and one extra hinge for each additional 12" of width or fraction thereof.

B. Raised Door Pull
   1. Manufacturer/Series:
      a. Folger Adam 2
      b. Southern Steel 212C
      c. R.R. Brink 300021
      d. Air-Teq 612
      e. Portland Hardware PH 701
   2. Investment Cast Stainless Steel
   3. Drilled and countersunk for TORX® security mounting screws
   4. US26D finish

C. Recessed Door Pull
   1. Manufacturer/Series:
      a. Folger Adam 4
      b. Southern Steel 214S
      c. R.R. Brink 300011
      d. Air-Teq 614
      e. Portland Hardware PH 702
   2. Investment Cast Stainless Steel
   3. Drilled and countersunk for TORX® security mounting screws
   4. US26D finish

D. Kickplate
   1. Manufacturer/Series:
      a. Rockwood K1125
      b. IVES 8400
   2. 6" high x 2" less than door width x 1/8" thick
   3. Stainless steel
   4. Beveled four edges
   5. Stop side mounted
   6. TORX® security mounting screws or 5/32" 18-8 stainless steel blind rivets
   7. US32D satin finish

E. Automatic Door Bottom
   1. Manufacturer/Series:
      a. Pemko 4301CRL
      b. National Guard Products 420NA
      c. Reese Enterprises 330C
   2. 2-3/4" high x door width x 31/32" deep
   3. TORX® security mounting screws
   4. Provide at all exterior openings or where scheduled
   5. Clear anodized aluminum

F. Smoke Gasket
   1. Manufacturer/Series:

a. Pemko S88D
b. National Guard 5050B
c. Reese Enterprises 797B
2. Press on gasket
3. Provide at head and jambs
4. Provide at all fire rated openings or where scheduled
5. Dark bronze

G. Wall Bumper
1. Manufacturer/Series:
a. Stanley 3002
2. 2-5/8" diameter x 1-1/4" projection
3. Convex design
4. Black neoprene 80-90 Shore A durometer hardness
5. Wall mounted
6. Attach with 3/8" x 2-1/2" TORX® security button head sleeve anchor expansion bolt
7. Use only at doors scheduled to receive raised pulls
8. Wall bumpers are not required if standard operation of door closer prohibits door from striking wall.

H. Door Stop
1. Manufacturer/Series:
a. Portland Security Hardware PSH-760
b. Hager 269T
2. 2" diameter x 3-1/2" projection
3. Black neoprene 80-90 Shore A durometer hardness
4. Wall mounted
5. Request approval from Architect for all floor mounted stop locations
6. Wall/Floor stops are not required if standard operation of door closer prohibits door from striking wall.

2.5 KEYS AND KEYING

A. The contractor of this section shall meet with the Owner and Architect to determine final keying requirements. Each key shall be individually stamped in accord with the following designations or any changes in designation provided during the keying meeting.

B. Keys shall be stamped with the following designations and provided in the following quantities:

1. Mogul Normal Use:

Code	Key Type	Description	Quantity
B1	Builder's Hardware	Detention Doors	10

C. Keys shall ship direct from the manufacturer to an authorized receiver via registered mail or UPS. The receiver of detention keys shall be determined during the keying meeting.

D. The DEC shall obtain a set of keys from the Owner for use during construction of the project. Keys shall be returned to the Owner upon completion of each work day. If keys are lost during construction, it will be the responsibility of the DEC to re-key all hardware effected by the loss at no additional cost to the project. The DEC shall exercise utmost care and sound judgment while in possession of detention keys.

PART 3 - EXECUTION

3.1 COORDINATION

A. The DEC shall verify all quantities, dimensions, and job site conditions before installation begins.

B. The DEC shall make periodic visits to the site to review the work of other trades as it relates to the installation of detention hardware.

3.2 INSTALLATION

A. Install detention hardware in strict accordance with manufacturer's recommendations.

B. Adjust all hardware components for proper operation. Draw tight all exposed security fasteners.

C. Field welding of metal to metal joints shall be in accord with manufacturer's recommendations. Exposed welds that occur at frame corners and shall start no further than 6 inches above sills. Grind welds smooth and fill spaces between welds with metal body putty filler. All metal to metal joints shall be completely filled and shall contain no cracks or seams that can be used for passage or storage of contraband. Use of security sealant in lieu of metal body putty filler prohibited.

D. All field welds shall be touched up with primer supplied by the detention sliding device manufacturer.

E. Security sealants at all metal to masonry/concrete joints will the responsibility of the Section 07700 Contractor.

F. It will be the responsibility of the DEC to touch up all scratches or paint damage that occurs during installation. Damaged surfaces shall be cleaned and touched up with primer prior to finish painting. The DEC shall use touch up primer provided by the detention sliding device manufacturer for compatibility with factory applied prime paint. Protection of work in place shall be in accord with Division 01 requirements.

3.3 SLEEVES

A. Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It shall be the DEC's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

B. Floor sleeves shall extend a minimum of 2 inches above the finished floor.

3.4 DETENTION HARDWARE CATEGORIES

A. The general layout of the detention hardware schedule is as follows:
1. DH-1: Exterior Doors
2. DH-2: Interior Doors
3. DH-3: Fire-rated Doors
4. DH-4: Owner Stock

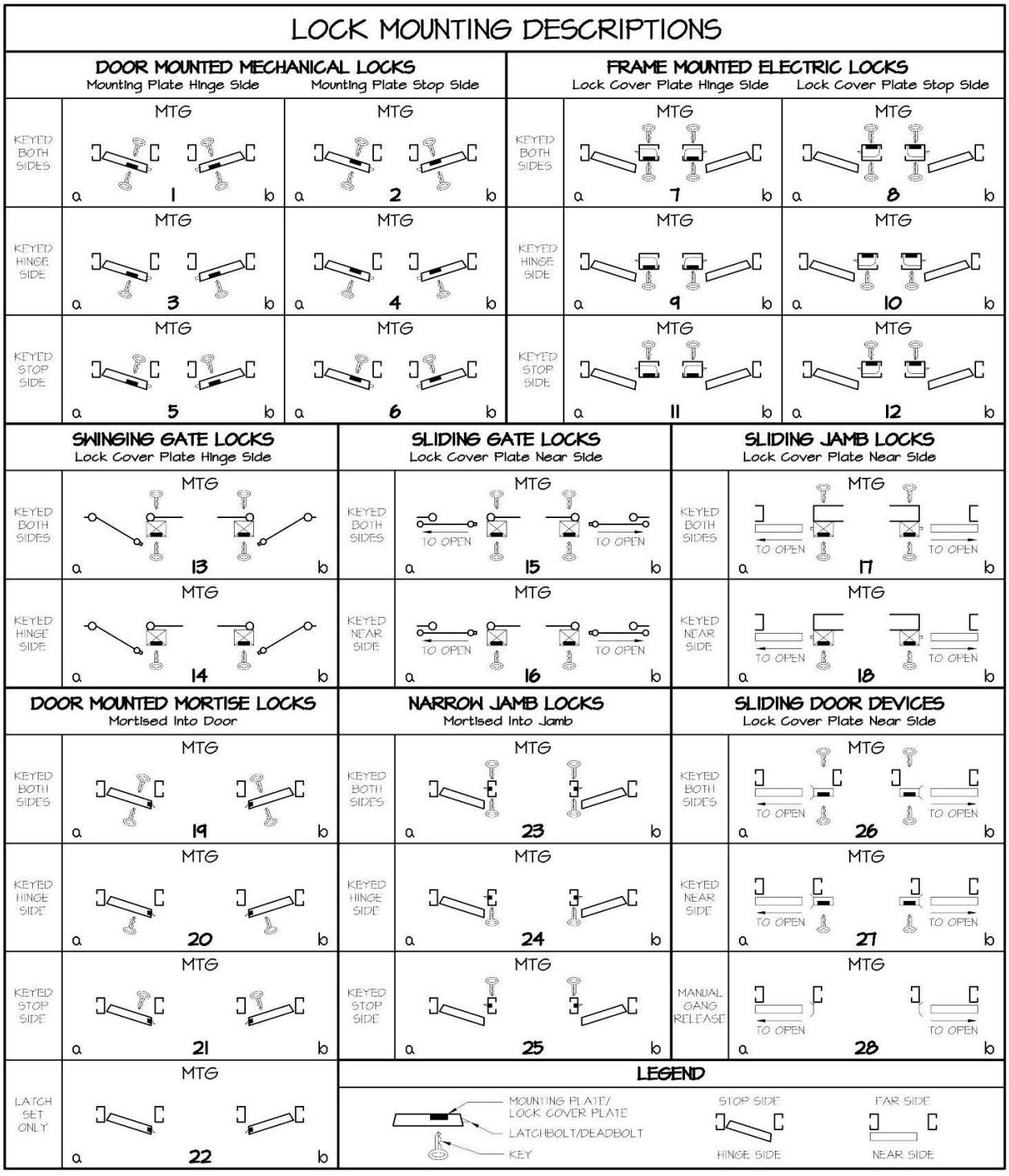
3.5 DETENTION HARDWARE SCHEDULE

DETENTION HARDWARE SCHEDULE

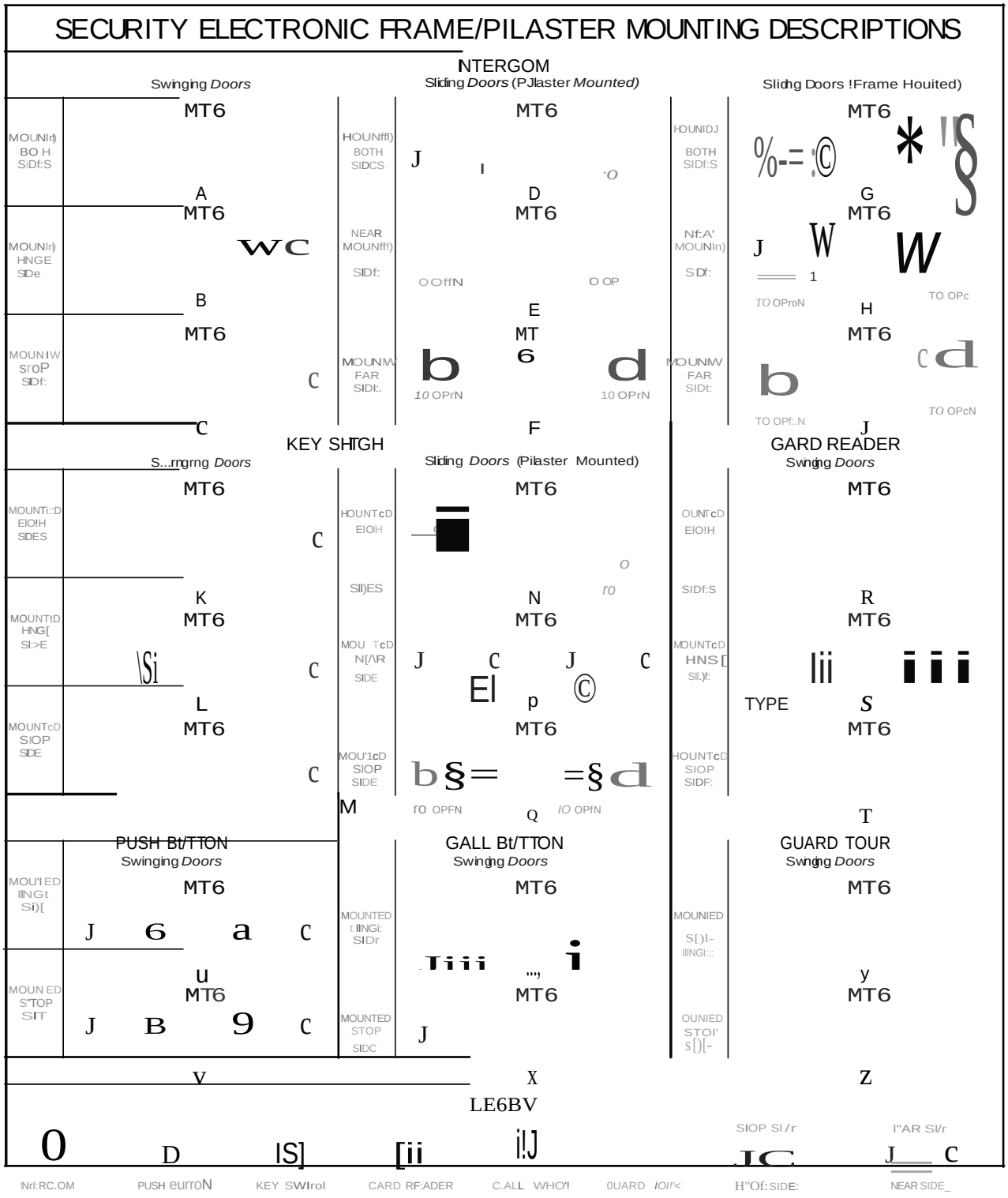
HDWR GRP	QTY	SE	DESCRIPTION	SUPPLIER	NOTES
DH-1			**EXTERIOR DOORS**		
	4		204FMSS Hinges	Southern Steel	1
	1	E	10300E-2 Solenoid Lock x 24VDC	Southern Steel	
	1		10300 Series Mortise Strikeplate	Southern Steel	
	1	D	2210-DPS Overhead Concealed Closer with Door Position Switch	LCN	
	2		212C Raised Pulls	Southern Steel	
	1		K1125 Kickplate	Rockwood	
	1		114A Pass-Proof Threshold	Pemko	
	1		Pass-Proof Threshold Hook x Type 304 S.S.	HM Manufacturer	
	1		312CR Jamb Weatherstrip	Pemko	
	1		347A Rain Drip	Pemko	
	1		68AR Drip Gasket		
	1		PSH-760 Door Stop	Portland Sec Hdwr	2
DH-2			**INTERIOR DOORS**		
	4		204FMSS Hinges	Southern Steel	1
	1	E	10300MD-2 Motor Lock x 24VDC	Southern Steel	
	1		10300 Series Mortise Strikeplate	Southern Steel	
	1	D	2210-DPS Overhead Concealed Closer with Door Position Switch	LCN	
	2		212C Raised Pulls	Southern Steel	
	1		K1125 Kickplate	Rockwood	
	1		114A Pass-Proof Threshold	Pemko	
	1		Pass-Proof Threshold Hook x Type 304 S.S.	HM Manufacturer	
	1		PSH-760 Door Stop	Portland Sec Hdwr	2
DH-3			**FIRE-RATED DOORS**		
	4		204FMSS Hinges	Southern Steel	1
	1	E	10300MD-2 Motor Lock x 24VDC	Southern Steel	
	1		10300 Series Mortise Strikeplate	Southern Steel	
	1		110-07 Passage Set x LTE LeverTrak	Folger Adam	3
	1		110-4DB Mortise Strike with Dust Box	Folger Adam	
	1	D	2210-DPS Overhead Concealed Closer with Door Position Switch	LCN	
	2		212C Raised Pulls	Southern Steel	
	1		K1125 Kickplate	Rockwood	
	1		114A Pass-Proof Threshold	Pemko	
	1		Pass-Proof Threshold Hook x Type 304 S.S.	HM Manufacturer	
	1		S88D Head and Jamb Press-On Smoke Seal	Pemko	4
	1		PSH-760 Door Stop	Portland Sec Hdwr	2

DETENTION HARDWARE SCHEDULE

HDWR GRP	QTY	SE	DESCRIPTION	SUPPLIER	NOTES
DH-4			**OWNER STOCK**		
	1	E	10300E-2 Motor Lock x 24VDC	Southern Steel	
	1	E	10300MD-2 Motor Lock x 24VDC	Southern Steel	
	2		10300 Series Mortise Strikeplate	Southern Steel	
	1		TSCRW-25 Torx Security Screw Maintenance Kit	Sentry Security Fas.	


LOCK MOUNTING DESCRIPTIONS
DOOR MOUNTED MECHANICAL LOCKS
Mounting Plate Hinge Side
Mounting Plate Stop Side
FRAME MOUNTED ELECTRIC LOCKS
Lock Cover Plate Hinge Side
Lock Cover Plate Stop Side
KEYED BOTH SIDES
KEYED HINGE SIDE
KEYED STOP SIDE
MTG
a
b
1
2
3
4
5
6
7
8
9
10
11
12
SWINGING GATE LOCKS
Lock Cover Plate Hinge Side
SLIDING GATE LOCKS
Lock Cover Plate Near Side
SLIDING JAMB LOCKS
Lock Cover Plate Near Side
KEYED NEAR SIDE
TO OPEN
13
14
15
16
17
18
DOOR MOUNTED MORTISE LOCKS
Mortised Into Door
NARROW JAMB LOCKS
Mortised Into Jamb
SLIDING DOOR DEVICES
Lock Cover Plate Near Side
MANUAL GANG RELEASE
19
20
21
23
24
25
26
27
28
LATCH SET ONLY
22
LEGEND
MOUNTING PLATE/ LOCK COVER PLATE
LATCHBOLT/DEADBOLT
KEY
STOP SIDE
FAR SIDE
HINGE SIDE
NEAR SIDE

SECURITY ELECTRONIC FRAME/PILASTER MOUNTING DESCRIPTIONS



DETENTION HARDWARE SCHEDULE NOTES

1. See specification section 11 19 20 for correct hinge quantity at each door opening.
2. Provide Stanley 3002 wall bumpers at raised pull locations whenever possible. Provide Portland Security Hardware PSH-760 door stops elsewhere. It will be the responsibility of the DEC to provide a wall stop suitable for each detention door opening condition. Selection of wall stop based upon wall construction, mounting location, specified hardware and guidelines noted. If floor stops are required, consult with A/E and Owner prior to mounting. Wall bumpers and door stops not required if standard operation of door closer prohibits door from striking wall.
3. Mount Passage Set at 38" to centerline of lever. Mount 10300 strike above passage set as close as possible to the mortised lock prep in the door.
4. Provide serrated cuts in smoke gasket 6" O.C. Provide serrated cuts in smoke gasket only at doors subject to normal (non-emergency) inmate traffic.

END OF SECTION

SECTION 11 20 00
SECURITY FASTENERS

PART 1 - GENERAL

1.1 SCOPE

A. This Section describes the requirements of security fasteners as shown on the Drawings and specified herein. Included are the following topics:

1.2 DESCRIPTION

A. All fasteners used in fabrication and installation of project components that are exposed to inmates in detention areas shall comply with the requirements of this Section. Requirements for security fasteners are excluded for the following items and locations:
   1. All fasteners in non-detention areas.
   2. Fasteners used above suspended ceilings
   3. Fasteners used behind access panels or within pipe and duct chases.
   4. Fasteners used for moveable furnishings, storage shelving and cabinet hardware.
   5. Fasteners used in mechanical, electrical, generator, communications and security electronics equipment rooms.
   6. Fasteners used within secured control rooms.
   7. Fasteners used for roof mounted equipment.

B. Applicable provisions of Division 01 govern work under this Section.

1.3 SUBMITTALS

A. Submit product data under provisions of Division 01.

1.4 QUALITY ASSURANCE

A. Materials under this specification shall be provided by one of the manufacturers listed. Security fasteners by other manufacturers may be considered upon written approval of the Architect. Requests for substitution shall include all pertinent technical data, descriptive product literature, and product specifications and must be received at least 7 days prior to the bid date of the date of the last published addendum, whichever is earlier.

B. Prospective manufacturers shall be able to furnish materials that meet or exceed the requirements of this specification. Manufacturers must be in good financial standing, and able to demonstrate that they have been actively engaged in the manufacturing of security fasteners for a minimum of 10 years.

C. Upon receipt of request for substitution, the A/E will make an investigation to determine the ability of the manufacturer to perform the work. The A/E reserves the right to request additional information as deemed necessary for the determination process. Upon approval, the prospective manufacturer will be listed by addendum.

D. TORX® is a registered trademark of Camcar Div. of Textron, Inc. All security fasteners shall be provided from a licensed manufacturer of TORX® products.

E. Approved manufacturers of security fasteners:
   1. Bryce Fastener Company, Inc. - Seattle, WA
   2. Camcar, Division of Texron, Inc. - Rockford, IL
   3. Holo-Krome Company - West Hartford, CT
   4. Safety Socket Screw Corporation - Chicago, IL
   5. Sentry Security Fasteners – Peoria, IL
   6. Tamper-Pruf Screws, Inc. – Paramount, CA
   7. Riteloc Company – Freeport, NY

PART 2 - PRODUCTS

2.1 SECURITY FASTNERS

A. Select fastener size, style and strength appropriate for their intended function. Fasteners installed in painted areas shall have heads primed for finish paint. Provide stainless steel construction for fasteners exposed in wet areas or installed in wet construction materials. Provide plated fasteners where required.

B. All exposed security fastener heads shall be TORX®, six point, pinned, tamper-resistant fasteners #4 through 3/4" diameter.

2.2 TOOLS

A. All security fasteners shall be operable by tools produced by the fastener manufacturer or by a producer licensed by the fastener manufacturer. The structural capacity of the tamper-resistant fasteners shall be in every instance equal to or greater than the physical properties of the fastening tool.

B. Size, shape and variations of security fasteners shall require no more than 12 different tools or wrenches to service all security fasteners on the project.

C. Provide 6 sets of tools for each size security screw installed on the project. Package tools in an individual container and deliver to the Owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Security fasteners shall be obtained by the manufacturer, supplier or installer of each component requiring their use. It shall be the project trades collective responsibility to assure that quantity of tools/wrenches required does not exceed the maximum quantity of tools required by this Specification.

3.2 INSTALLATION

A. Install security fasteners in accordance with manufacturer's instructions using proper tools and procedures.

B. Draw tight all exposed security fasteners. Tack weld all hex-head expansion type fasteners exposed to the inmate within the security perimeter.

C. It will be the responsibility of the Contractor to replace damaged or defective fasteners. It will also be the responsibility of the Contractor to ascertain that the replacement fasteners will not adversely affect the anchorage, performance, operation, warranty or any other aspect of the products anchored or assembled.

END OF SECTION

SECTION 12 36 61
SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Solid-surface-material countertops and backsplashes.

B. Related Sections:

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts as needed.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Wood trim, 8 inches long.
3. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.5 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: 3/4-inch bullnose.
2. Backsplash: Straight, slightly eased at corner.

3. Endsplash: Matching backsplash.

B. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.

C. Countertops: 1/4-inch- thick, solid surface material laminated to 3/4-inch- thick particleboard with exposed edges built up with 3/4-inch- thick, solid surface material.

D. Backsplashes: 3/4-inch- thick, solid surface material.

E. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.

2.2 COUNTERTOP MATERIALS

A. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. as indicated on the drawings.

2. Type: Provide Standard Type or Veneer Type made from material complying with requirements for Standard Type, as indicated unless Special Purpose Type is indicated.
3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
4. Colors and Patterns: As indicated by as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

END OF SECTION 12 36 61

SECTION 22 05 18
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
i. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD **QUALITY** CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron swing check valves with closure control.
7. Bronze gate valves.
8. Iron gate valves.
9. Bronze globe valves.
10. Iron globe valves.
11. Chainwheels.

1.2 **ACTION** SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.

2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kitz Corporation.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig (2760 kPa).
c. Body Design: One piece.
d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Kitz Corporation.
c. Milwaukee Valve Company.
d. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Valve, Inc.
    b. Conbraco Industries, Inc.; Apollo Valves.
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 400 psig (2760 kPa).
    c. Body Design: One piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE or TFE.
    g. Stem: Bronze.
    h. Ball: Chrome-plated brass.
    i. Port: Reduced.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Valve, Inc.
    b. Conbraco Industries, Inc.; Apollo Valves.
    c. Crane Co.; Crane Valve Group; Crane Valves.
    d. Milwaukee Valve Company.
    e. NIBCO INC.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig (1035 kPa).
    c. CWP Rating: 600 psig (4140 kPa).
    d. Body Design: Two piece.
    e. Body Material: Bronze.
    f. Ends: Threaded.
    g. Seats: PTFE or TFE.
    h. Stem: Bronze.
    i. Ball: Chrome-plated brass.
    j. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.; Apollo Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.

c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Kitz Corporation.
d. Legend Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

C. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. Mueller Steam Specialty; a division of SPX Corporation.
g. NIBCO INC.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

D. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. Mueller Steam Specialty; a division of SPX Corporation.
g. NIBCO INC.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Kitz Corporation.
    c. Milwaukee Valve Company.
    d. NIBCO INC.
    e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-80, Type 4.
    b. CWP Rating: 200 psig (1380 kPa).
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B 62, bronze.
    e. Ends: Threaded.
    f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Kitz Corporation.
    c. Legend Valve.
    d. Milwaukee Valve Company.
    e. NIBCO INC.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. CWP Rating: 200 psig (1380 kPa).
    c. Body Design: Clear or full waterway.
    d. Body Material: ASTM A 126, gray iron with bolted bonnet.
    e. Ends: Flanged.
    f. Trim: Bronze.
    g. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. CWP Rating: 200 psig (1380 kPa).
    c. Body Design: Clear or full waterway.
    d. Body Material: ASTM A 126, gray iron with bolted bonnet.
    e. Ends: Flanged.
    f. Trim: Composition.

g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: PTFE or TFE.
j. Gasket: Asbestos free.

2.7 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. NIBCO INC.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed, exterior lever and spring.

B. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed, exterior lever and weight.

2.8 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Kitz Corporation.
d. Milwaukee Valve Company.

e. NIBCO INC.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.9 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Kitz Corporation.
c. Legend Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Kitz Corporation.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.10 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Kitz Corporation.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.11 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Kitz Corporation.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.12 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve. Include zinc coating.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for butterfly gate and globe valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.

1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service: Globe or ball or butterfly valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
    c. NPS 2-1/2 (DN 65) and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG (1035 kPa) OR LESS)

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: One or Two piece, full port, brass or bronze with brass or bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS RS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, NBR seat, aluminum-bronze disc.

3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Gate Valves: Class 125, NRS or OS&Y.

3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG (1035 TO 1380 kPa))

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: One or Two piece, full port, brass or bronze with brass or bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, NBR seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Gate Valves: Class 125, OS&Y.

3.6 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: One or Two piece, full port, brass or bronze with brass or bronze trim.
4. Bronze Swing Check Valves: Class 125, disc.
5. Bronze Gate Valves: Class 125, NRS.
6. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
5. Iron Gate Valves: Class 125, OS&Y.
6. Iron Globe Valves: Class 125.

3.7 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: One or Two piece, full port, brass or bronze with brass or bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS.
5. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron Swing Check Valves: Class 125, metal seats.
3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
4. Iron Gate Valves: Class 125, OS&Y.
5. Iron Globe Valves: Class 125.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) or ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified elsewhere in these specifications.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).

c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.

1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Valve Tags:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled fastender hole or stamped holes for attachment hardware.
2. Minimum Label Size: 1 1/2” diameter.
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Brass or stainless steel wire bead chain.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules).

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: ASME (ANSI) A13.1 Color Chart.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Low-Pressure, Compressed-Air Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

2. Medium-Pressure, Compressed-Air Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

3. Domestic Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

4. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Black.
   b. Letter Color: White.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic hot-water piping.
2. Domestic recirculating hot-water piping.
3. Sanitary waste piping exposed to freezing conditions.
4. Storm-water piping exposed to freezing conditions.
5. Roof drains and rainwater leaders.
6. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include completed plates from the National Commercial & Industrial Insulations Standards Manual (Volume 6 or later) for the following applications:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
3. Application of field-applied jackets.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Pittsburgh Corning Corporation; Foamglas.

2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
4. Preformed Pipe Insulation with Factory-Applied ASJ ASJ-SSL: Comply with ASTM C 552, Type II, Class 2
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Refrigerant Piping Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Note: Paint exterior exposed insulation with ultra-violet (UV) protective paint.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Micro-Lok.
    b. Knauf Insulation; 1000-Degree Pipe Insulation.
    c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
   d. Mon-Eco Industries, Inc.; 55-50.
   e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.

d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

Note: Exposed pipe insulation in kitchen areas and areas subject to abuse shall have PVC jacket for ease of wash cleaning and protection.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

Note: Aluminum jacket is required on all exterior exposed insulated piping.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing or Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper or 2.5-mil- (0.063-mm-) thick polysurlyn.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil- (3.2-mm-) thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Pittsburgh Corning Corporation; Pittwrap.
    b. Polyguard Products, Inc.; Insulrap No Torch 125.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 3 inches (75 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 3/4 inch (19 mm) wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C & F Wire.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Engineered Brass Company.
    b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
    c. McGuire Manufacturing.
    d. Plumberex.
    e. Truebro; a brand of IPS Corporation.
    f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Truebro; a brand of IPS Corporation.
    b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: General Contractor and Mechanical Contractor shall clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application. Piping shall be clean and free of debris such as fireproofing, mortar, grout, etc.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Installation shall conform to the National Commercial & Industrial Insulation Standards Manual published by the Midwest Contractor's Association (MICA). www.micainsulation.org

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

H. Keep insulation materials dry during application and finishing.

I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

J. Install insulation with least number of joints practical.

K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

M. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

N. Cut insulation in a manner to avoid compressing insulation. Do not compress more that 25 percent of its nominal thickness.

O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere and seal patches similar to butt joints.

Q. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

R. Provide high density foamglas insulation inserts at hanger locations between pipe and pipe shield. Wood blocks are not acceptable. Maintain a continuous vapor barrier through the hangers and match jacketing of adjoining pipe insulation.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Roofing Contractor shall seal penetrations with flashing sealant. Insulation penetrations through roof must be complete before final seal by Roofing Contractor.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. General Contractor shall seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. General Contractor shall seal penetrations through fire-rated assemblies.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire, bands or strapping tape and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION (REFRIGERANT PIPING)

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of elastomeric paint insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold, Hot and Recirculated Hot Water: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

B. Stormwater and Overflow: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

C. Roof Drain and Overflow Drain Bodies: Insulation shall be the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be pre-formed insulation kits for piping below lavatories and sinks.

E. Sanitary Waste Piping Where Heat Tracing Is Installed: Mineral-fiber, preformed pipe insulation, Type I, 1-1/2 inches (38 mm) thick.

3.13 OUTDOOR, ABOVEGROUND EXPOSED TO WEATHER PIPING INSULATION SCHEDULE

A. Domestic Water Piping: Insulation shall be one of the following:

1. Cellular Glass: 2 inches (50 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

B. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Cellular Glass: 2 inches (50 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

C. Sanitary Waste Piping Where Heat Tracing Is Installed: Insulation shall be one of the following:

1. Cellular Glass: 2 inches (50 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

3.14 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed: Cellular glass, 2 inches (50 mm) thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed:

1. None.

C. Piping, Exposed to the general public or where noted on plans, or where exposed in kitchens.

1. PVC: 20 mils (0.5 mm) thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping:

1. Aluminum, Stucco Embossed: 0.032 inch (0.81 mm) thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings (Viega Pro-Press System):

1. Fittings for NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys.

B. Flux: ASTM B 813, water flushable.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

   a. Hart Industries International, Inc.
   b. McDonald, A. Y. Mfg. Co.
   c. Watts; a division of Watts Water Technologies, Inc.
   d. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

   a. Watts; a division of Watts Water Technologies, Inc.
   b. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig (1035 kPa).
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

a. Grinnell Mechanical Products; Tyco Fire Products LP.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig (2070 kPa) at 225 deg F (107 deg C).
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves.

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.

S. Install thermostats in hot-water circulation piping.

T. Install thermometers on inlet and outlet piping from each water heater.

U. Install sleeves for piping penetrations of walls, ceilings, and floors.

V. Install sleeve seals for piping penetrations of concrete walls and slabs.

W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges nipples.

D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install for seismic-restraint devices.

B. Install pipe hanger and support products.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

F. Install supports for vertical copper tubing every 10 feet (3 m).

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.7 IDENTIFICATION

A. Identify system components.

B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 (DN 100 to DN 200) and larger, shall be the following:

1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.

F. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and soldered joints.

G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and soldered joints.

H. Aboveground domestic water piping, NPS 5 to NPS 8 (DN 125 to DN 200), shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and brazed joints.

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa) unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough Bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.

2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Standard: ASSE 1012.
2. Operation: Continuous-pressure applications.
3. Size: NPS 1/2 (DN 15) or NPS 3/4 (DN 20).
4. Body: Bronze.
5. End Connections: Union, solder joint.
6. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 (DN 50) and smaller; stainless steel for NPS 2-1/2 (DN 65) and larger.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
6. Accessories:

    a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 (DN 50) and smaller; stainless steel for NPS 2-1/2 (DN 65) and larger.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
6. Accessories:

    a. ValvesNPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
    b. ValvesNPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Honeywell International Inc.
    b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
    c. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
4. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
7. Required where service entry pressures are in excess of 80 psi,

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Milwaukee Valve Company.
    d. NIBCO Inc.
    e. Tour and Andersson

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
4. Size: NPS 2 (DN 50) or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Leonard Valve Company.
    b. Powers; a division of Watts Water Technologies, Inc.
    c. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig (860 kPa).
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lawler Manufacturing Company, Inc.

b. Leonard Valve Company.
c. Powers; a division of Watts Water Technologies, Inc.
d. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig (860 kPa)minimum unless otherwise indicated.
4. Type: Cabinet-type, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Polished, chrome plated.
9. Piping Finish: Chrome plated.
10. Cabinet: Factory fabricated, stainless steel, for recessed or surface mounting and with hinged, stainless-steel door.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

a. Strainers NPS 2 (DN 50) and Smaller: 0.020 inch (0.51 mm).
b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch (1.14 mm).
c. Strainers NPS 5 (DN 125) and Larger: 0.10 inch (2.54 mm).

6. Drain: Factory-installed, hose-end drain valve.

2.9 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig (860 kPa).
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig (860 kPa).
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig (860 kPa).
3. Operation: Loose key.
4. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
6. Outlet: Concealed.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Vacuum Breaker:

    a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

10. Operating Keys(s): One with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Precision Plumbing Products, Inc.
    d. Sioux Chief Manufacturing Company, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. MIFAB, Inc.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig (860 kPa) minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Plumbest.

2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.
3. Size: NPS 1-1/4 (DN 32) minimum.
4. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

F. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.

G. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

A. Ground equipment as per electrical requirements.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 13 16
DRAINAGE, WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ANACO-Husky.
   b. MIFAB, Inc.
   c. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ANACO-Husky.
    b. Clamp-All Corp.
    c. MIFAB, Inc.
    d. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 ABS PIPE AND FITTINGS

A. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.

B. Plastic piping not allowed in return air plenums.

C. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

D. Solvent Cement: ASTM D 2235.

1. ABS solvent cement shall have a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Plastic piping not allowed in return air plenums.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dallas Specialty & Mfg. Co.
        2) Fernco Inc.
        3) Mission Rubber Company; a division of MCP Industries, Inc.
        4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

    b. Standard: ASTM C 1173.
    c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company; a division of MCP Industries, Inc.

    b. Standard: ASTM C 1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install seismic restraints on piping.

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

N. Install aboveground ABS piping according to ASTM D 2661.

O. Install aboveground PVC piping according to ASTM D 2665.

P. Install underground ABS and PVC piping according to ASTM D 2321.

Q. Plumbing Specialties:

1. Install backwater valves in sanitary waste gravity-flow piping.
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping.
3. Install drains in sanitary drainage gravity-flow piping.

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.

2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install seismic-restraint devices.

B. Install pipe hanger and support devices.

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
4. NPS 3 and NPS 5 (DN 80 and DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
5. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
6. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

I. Install supports for vertical copper tubing every 10 feet (3 m).

J. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.

K. Install supports for vertical ABS and PVC piping every 48 inches (1200 mm).

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints where allowed by code.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints where allowed by code.

C. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints where allowed by code.

D. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints where allowed by code.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints where allowed by code.

E. Aboveground, vent piping NPS 5 (DN 125) and larger shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints where allowed by code.

F. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

G. Underground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.

END OF SECTION

SECTION 22 13 19
DRAINAGE WASTE AND VENT PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof flashing assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.
7. Grease interceptors.
8. Roof drains & overflow drains.
9. Downspout nozzle.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
   c. Tyler Pipe; Wade Div.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: Hub and spigot
7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed.
8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
    c. Watts Drainage Products Inc.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Size: Same as floor drain outlet.
3. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
4. Check Valve: Removable ball float.
5. Inlet: Threaded.
6. Outlet: Threaded or spigot.

2.2 CLEANOUTS

A. Full size of pipe up to 4". Locate at base of stacks, ends of main, changes in directions greater that 135 degrees. Install cleanouts at 50'-0" in all waste piping inside of building and every 75'-0" outside of building.

B. Exposed Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

C. Cast-Iron Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Finished Floors: Zurn Z-1400 - Adjustable floor level cleanouts - polished bronze top.
3. Carpeted Floors: Zurn Z-1400 - Adjustable floor level cleanouts - polished bronze top - carpet marker.

D. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Finished Walls: Zurn Z-1468 stainless steel round wall access cover complete with securing screw and bronze raised hex plug.

2.3 FLOOR DRAINS / FLOOR SINKS / ROOF DRAINS

A. Cast-Iron Floor Drains / Floor Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

B. FLOOR DRAIN DESIGNATIONS / APPLICATIONS:

1. Zurn ZN-415-7O Z.B. with “Type O” raised lip strainer in linoleum or asphalt tile floors.
2. Zurn ZN-415-Z.B. with “Type S” square strainer in ceramic tile, quarry tile or terrazzo floors.
3. Zurn ZN-415-Z.B. with “Type B” round strainer for general floor drain - 2" drain to have 5" strainer, 3" drain to have 6" strainer, 4" drain to have 8" strainer.
4. Zurn Z-611 In boiler, chiller, and air handling rooms. Slotted loose half grate with suspended sediment bucket.
5. Zurn Z-645 as marked for area drains. Slotted loose full grate with suspended sediment bucket. Install without trap when used in exterior applications.
6. Furnish Zurn Z-415-7E funnel drain with “Type E” polished nickel bronze strainer and 4” diameter funnel where indicated on the drawings.
7. Deep seal cast iron P-trap. Furnish with trap primer connection as required by local codes or where shown on the plumbing drawings.
8. General Contractor to locate and set elevations for drains, no deviation made from this without permission of the Architect.

C. FLOOR SINKS / FLOOR TROUGH

1. Deep cast iron body and slotted medium duty ¾ grate, with white acid resisting porcelain enamel interior and top, complete with aluminum anti-splash interior bottom dome strainer. Floor sinks with indirect waste connections shall be set with the open part of the grate under the equipment so that the indirect piping is out of the way. Verify kitchen equipment sizes and orientation so that floor sinks are located to catch all drainage associated with each piece of equipment.

    a. FS-1 Zurn Model Z-1901 (12" x 12" x 8") Full Grate

b. FS-2 Zurn Model Z-1901 (12" x 12" x 8") ¾ Grate

c. FT-1 Advance Tabco FTG-2436 (24” x 36” x 4”) Full Grate

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch- minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain / Floor Sink, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 GREASE INTERCEPTORS

A. Grease Interceptors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Clutter Company - Maize, Kansas.
b. Reliable Concrete Products - Kansas City, Kansas.

2. Prefabricated reinforced concrete vault - 1000 gallon grease retention capacity in-line use below grade / under slab installation with manholes & covers. Refer to plans for additional information.

2.8 ROOF DRAINS & OVERFLOW DRAINS

A. Dura-coated cast iron body with combination membrane flashing clamp/gravel guard and low silhouette mushroom type cast iron dome strainer. Sump receiver, under deck clamp, and extension where required. Provide 2" internal water dam for overflow drains. Equal to Zurn Model Z-100.

2.9 DOWNSPOUT NOZZLES

A. Cast bronze, loose wall flange and inlet threaded connection with rough bronze finish. Equal to Zurn Z-199.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 1 inch above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
5. Interceptor shall be vented.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches , and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 42 13.13
COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. TOTO USA, INC.
d. Sloan.

2. Bowl:

a. Material: Vitreous china.
b. Style: Flushometer valve or tank type as per fixture schedule.
c. Height: Refer to plumbing fixture schedule.
d. Rim Contour: Elongated.
e. Water Consumption: 1.28 gal. (4.8 L) or 1.6 gal. (6 L) per flush as per plumbing fixture schedule.
f. Spud Size and Location: NPS 1-1/2 (DN 40); top.
g. Color: White.

2.2 WALL-MOUNTED WATER CLOSETS

A. Water Closets: Wall mounted, top spud, accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

   a. American Standard America.
   b. Kohler Co.
   c. TOTO USA, INC.
   d. Sloan.

2. Bowl:

   a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
   b. Material: Vitreous china.
   c. Type: Siphon jet.
   d. Style: Flushometer valve.
   e. Height: Standard.
   f. Rim Contour: Elongated.
   g. Water Consumption: 1.28 gal. (4.8 L) or 1.6 gal. (6 L) per flush as scheduled.
   h. Spud Size and Location: NPS 1-1/2 (DN 40); top.

3. Support:

   a. Standard: ASME A112.6.1M.
   b. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
   c. Water-Closet Mounting Height: as per plumbing fixture schedule.

2.3 PENAL GRADE WATER CLOSET

A. Provide and install Siphon Jet Toilet, On-Floor. Toilet bowl shall be fabricated from 14 gage, type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Toilet shall be concealed siphon jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured seat. Toilet shall meet ASME A112.19.3-2008 requirements and CSA B45.4-2008 requirements and will flush with a minimum of 25 PSI flow pressure when used in conjunction with a minimum of 1.6 GPF. Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Fixture shall withstand loadings of 5,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.

2.4 FLUSHOMETER VALVES

A. Lever-Handle or Electronic Sensor Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

   a. Coyne & Delany Co.
   b. Sloan Valve Company.

c. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig (860 kPa).
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed or Concealed as per plumbing fixture schedule.
9. Consumption: 1.28 gal. (4.8 L) or 1.6 gal. (6 L) per flush as per plumbing fixture schedule.
10. Minimum Inlet: NPS 1 (DN 25).
11. Minimum Outlet: NPS 1-1/4 (DN 32).
12. Sensor type flush valves shall include all accessories including transformers or batteries as required for proper operation.

B. Lever-Handle or Electronic Sensor Piston Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

a. Coyne & Delany Co.
b. Sloan Valve Company.
c. TOTO USA, INC.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig (860 kPa).
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed or Concealed as per plumbing fixture schedule.
9. Consumption: 1.28 gal. (4.8 L) or 1.6 gal. (6 L) per flush as per plumbing fixture schedule.
10. Minimum Inlet: NPS 1 (DN 25).
11. Minimum Outlet: NPS 1-1/4 (DN 32).
12. Sensor type flush valves shall include all accessories including transformers or batteries as required for proper operation.

2.5 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

a. American Standard America.
b. Bemis Manufacturing Company.
c. Church Seats.
d. Kohler Co.
e. Olsonite Seat Co.
f. TOTO USA, INC.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).

5. Shape: As per plumbing fixture schedule.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install all sensors as per manufacturer's installation instruction requirements. Coordinate sensor placement with other trades as sensor location is critical for correct operation.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.

3.2 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.3 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 42 16.13
COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory: Oval or Round as per plumbing fixture schedule, self rimming, vitreous china, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. TOTO USA, INC.
d. Sloan.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: Self-rimming for above-counter mounting.
c. Nominal Size: See plumbing fixture schedule.
d. Nominal Size: See plumbing fixture schedule.
e. Faucet-Hole Punching: See plumbing fixture schedule.
f. Faucet-Hole Location: Top.
g. Color: White.
h. Mounting Material: Sealant.

B. Lavatory: Oval or Round as per plumbing fixture schedule, vitreous china, undercounter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. TOTO USA, INC.
d. Sloan.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For undercounter mounting.
c. Nominal Size: See plumbing fixture schedule.
d. Faucet-Hole Punching: No holes.
e. Faucet-Hole Location: On countertop, coordinate with faucet.
f. Color: White.
g. Mounting Material: Sealant and undercounter mounting kit.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. Toto USA, Inc.
d. Sloan.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Nominal Size: See plumbing fixture schedule.
d. Faucet-Hole Punching: See plumbing fixture schedule.
e. Faucet-Hole Location: Top.
f. Color: White.
g. Mounting Material: Chair carrier.

3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier with escutcheons. Include rectangular, steel uprights.

2.3 SOLID-BRASS, MANUALLY OR AUTOMATICALLY OPERATED FAUCETS (As per Schedule).

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, Automatic type single-control mixing commercial, battery powered or hard wired sensor operated mixing commercial, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

   a. American Standard America.
   b. Chicago Faucets.
   c. Delta Faucet Company.
   d. Sloan Valve.
   e. Kohler Co.
   f. T & S Brass and Bronze Works, Inc.

2. Standard: ASME A112.18.1/CSA B125.1 and U.L. 1951.
3. Electrical components, devices and accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm (1.5 L/min.).
8. Maximum Flow: 0.25 gal. (0.95 L) per metering cycle.
9. Mounting Type: Deck, exposed Deck, concealed Back/wall, exposed Back/wall, concealed.
10. Valve Handle(s): Single lever or wrist blades as per plumbing fixture schedule.
11. Mixing Valves: Provide accessible mixing valve with integral checks for automatic sensor operated faucets.
12. Spout Outlet: Aerator.
13. Operation: Compression, manual.
14. Drain: pop-up or grid as per plumbing fixture schedule.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 1/2 (DN 15).
2. Chrome-plated, soft-copper flexible tube or ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- (0.30-mm-) thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

E. Seal joints between lavatories and counters and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 42 23
COMMERCIAL SHOWERS, RECEPTORS, AND BASINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Individual showers.
2. Shower faucets.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 INDIVIDUAL SHOWERS

A. Individual FRP Showers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Aqua Glass Corporation.
   b. Best Bath Systems, Inc.
   c. Hamilton.
   d. LASCO Bathware.
   e. Praxis Industries, LLC.; Aquarius Bathware.
   f. Sterling; a Kohler company.
   g. Swan Corporation (The).

2. General: FRP, accessible, shower enclosure with faucet and receptor and appurtenances.
3. Standard: ANSI Z124.1.2.
4. Type: One-piece unit without top Sectional unit with top.
5. Style: Standard residential or Handicapped/wheelchair; see drawings.
6. Faucet: see drawings.
7. Bathing Surface: Slip resistant according to ASTM F 462.
8. Outlet: Drain with NPS 2 (DN 50) outlet.
9. Shower Rod and Curtain: Not required.
10. Grab Bar: ASTM F 446, mounted on support area back wall.

2.2 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn.
    b. American Standard America.
    c. Bradley.
    d. Chicago Faucets.
    e. Delta Faucets.
    f. Kohler Co.
    g. Lawler Manufacturing Co., Inc.
    h. Leonard Valve Company.
    i. Powers; a division of Watts Water Technologies, Inc.
    j. Symmons Industries.

2. Description: Single-handle, pressure-balance mixing valve with hot and cold-water indicators; check stops; and shower head.
3. Faucet:

    a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
    b. Body Material: Solid brass.
    c. Finish: Polished chrome plate.
    d. Maximum Flow Rate: 1.5 gpm (9.5 L/min.) unless otherwise indicated.
    e. Mounting: Concealed.
    f. Operation: Single-handle, twist or rotate control.
    g. Antiscald Device: Integral with mixing valve.
    h. Check Stops: Check-valve type, integral with or attached to body; on hot and cold-water supply connections.

4. Supply Connections: NPS 1/2 (DN 15).
5. Shower Head:

    a. Standard: ASME A112.18.1/CSA B125.1.
    b. Type: Ball joint with arm and flange.
    c. Shower Head Material: Metallic with chrome-plated finish.
    d. Spray Pattern: Adjustable.
    e. Integral Volume Control: as scheduled on drawings.
    f. Shower-Arm, Flow-Control Fitting: 1.5 gpm (5.7 L/min.).

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble shower components according to manufacturers' written instructions.

B. Install showers level and plumb according to roughing-in drawings.

C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with shower.
2. Install stops in locations where they can be easily reached for operation.

D. Install shower flow-control fittings with specified maximum flow rates in shower arms.

E. Set shower receptors in leveling bed of cement grout.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.2 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.3 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

A. After completing installation of showers, inspect and repair damaged finishes.

B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 47 16
PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pressure water coolers and related components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to 20 percent of quantity installed for each type and size indicated, but no fewer than 2 of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Wall mounted, standard, wheelchair accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.
d. Acorn

2. Cabinet: Single or Bi-level (as scheduled on plans) with attached cabinets and with a skirt kit, all stainless steel.
3. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
4. Control: Push bar.
5. Drain: Grid with NPS 1-1/4 (DN 32) tailpiece.
6. Supply: NPS 3/8 (DN 10) with shutoff valve.

7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) brass P-trap.
8. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
9. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

10. Capacities and Characteristics:

    a. Cooled Water: 8 gph (0.0084 L/s).
    b. Ambient-Air Temperature: 90 deg F (32 deg C).
    c. Inlet-Water Temperature: 80 deg F (27 deg C).
    d. Cooled-Water Temperature: 50 deg F (10 deg C).

11. Support: ASME A112.6.1M, Type I water-cooler carrier.

2.2 PEDESTAL MOUNTED OUTDOOR DRINKING FOUNTAIN

A. Provide a barrier free pedestal mounted, vandal resistant, bi-level round drinking fountain made from 18 gage, 304 stainless steel. Basin shall be mounted onto a heavy duty, 12 gage welded stainless steel pedestal. Unit shall be activated by front mounted self-closing buttons, by using less than 5 pounds of force, which activates internally mount valves with adjustable stream regulators controlling the water flow. Bubblers shall be polished chrome plated brass with non-squirt features and operate on a water pressure range of 20-105 psig. Unit shall adhere to ANSI A117.1 and Americans with Disabilities Act of 2010 frontal approach and protruding objects requirements, Adult ADA parallel and frontal approach and ANSI/NSF 61, Section 9 and Public Law 111-380.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set freestanding pressure water coolers on floor.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings.

G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

B. All Division 23 work as specified herein shall be provided by the HVAC Contractor unless otherwise specified on the Bid Form.

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

B. This Section of Work applies to all work specified under Division 23.

1.4 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1. AABC Associated Air Balance Council
2. ADC Air Diffusion Council
3. AGA American Gas Association
4. AMCA Air Movement and Control Association
5. ANSI American National Standards Institute
6. ARI Air-Conditioning and Refrigeration Institute
7. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
8. ASME American Society of Mechanical Engineers
9. ASTM American Society for Testing and Materials
10. AWS American Welding Society
11. EPA Environmental Protection Agency
12. IEEE Institute of Electrical and Electronics Engineers
13. ISA Instrument Society of America
14. MCA Mechanical Contractors Association
15. MICA Midwest Insulation Contractors Association
16. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
17. NBS National Bureau of Standards
18. NEBB National Environmental Balancing Bureau
19. NEC National Electric Code
20. NEMA National Electrical Manufacturers Association
21. NFPA National Fire Protection Association
22. SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
23. UL Underwriters' Laboratories Inc.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. The Contractor shall review his own work for compliance with the construction documents. Prior to punch list activity by A/E, the contractor shall provide documentation to the A/E that a review has taken place and shall issue a letter indicating that the work has been performed in compliance with the construction documents. In the event that the contractor does not satisfactorily review his own work and results in additional site visits by the A/E, the contractor shall reimburse the A/E for the additional time required to close out the project.

1.6 ABBREVIATIONS

A. A/E Architect/Engineer

B. GC General Contractor

C. FPC Fire Protection Contractor

D. PC Plumbing Contractor

E. HC Heating Contractor

F. EC Electrical Contractor

G. TCC Temperature Contractor

H. DDC Direct Digital Controls

I. BAS Building Automation System

J. TCS Temperature Control System

1.7 DEFINITIONS

A. Furnish
   1. Supply and deliver to the project site ready for unpacking, assembly and installation

B. Install
   1. Operations at the site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting all related devices required for a product that is fully functional for its intended use after its installation.

C. Provide
   1. Furnish and install product as required to be fully functional for its intended use.

1.8 DRAWINGS

A. The drawings show the general arrangement of piping, equipment and appurtenances and shall be followed as closely as actual building construction and work of other trades permits. Work shall conform to requirements shown on the drawings. Architectural and structural drawings shall take precedence. Because of the scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. Investigate structural and finish

conditions affecting work and arrange work accordingly, providing offsets, fittings and accessories as may be required to meet as constructed conditions.

B. HVAC equipment and systems, including piping and ductwork shall be installed as high as possible unless otherwise noted on drawings. Equipment and systems shall also be installed to maintain required operation and maintenance clearances.

1.9 CAD DRAWINGS

A. Drawings in an electronic format can be made available to the successful HVAC contractor at a non-refundable cost as specified under Division 01 of the specifications. If no cost is specified in Division 01, the default cost shall be $75 per drawing. The drawings provided may or may not be updated to reflect all addenda items. The use of the drawings is limited to this project and may not be forwarded to any other party, or used for any other purpose. Use of the files will be at the contractor's sole risk and without liability or legal exposure to Arnold & O'Sheridan, Inc or its employees. Architectural drawings or any other drawings not produced by Arnold & O'Sheridan will not be provided.

1.10 CODES AND STANDARDS

A. All materials and workmanship shall comply with applicable codes, specifications, local ordinances, industry standards and utility company regulations. In case of differences between building codes, specifications, state laws, local ordinances, industry standards and utility company regulations and contract documents, the most stringent shall govern. Promptly notify A/E in writing of differences.

B. Non-compliance
   1. If the Contractor installs materials or performs any work that does not comply with above requirements, he shall correct the work and shall bear all costs arising from correcting deficiencies.

1.11 CONTINUITY OF EXISTING SERVICES

A. Refer to Division 01 of the Project Manual.

B. Do not interrupt or change existing services without prior approval from the Owner, Architect, Engineer or Construction Manager. When interruption is required, coordinate the down-time with the Owner to reduce disruption to his activities. The scope of this work is indicated on the Contract Documents or described herein. Unless specifically stated, work involved in interrupting or changing existing services is to be done during off hours.

1.12 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01 of the Project Manual.

B. Furnish one can of touch-up paint for each different color factory finish which is to be the finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.13 SUBMITTALS

A. Refer to Division 01 and the General Conditions of the Contract.

B. Shop drawings are to be reviewed by the lead contractor and the HVAC contractor before submission to the A/E. Submittals shall be stamped by the contractor and clearly indicate all corrections made by the contractor during their

review process. Submittals not reviewed and stamped by the contractor will be automatically rejected.

C. Submit for equipment and systems as specified in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and number, as identified in the contract documents. Include the plan designation mark (i.e. "AHU-1") on the submittals. Include dimensions, capacities, ratings, and installation instructions.

D. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor schedule on the HVAC and electrical drawings. Include a statement on the shop drawing transmittal to the Architect/Engineer if the equipment submitted and the motor schedules are not in agreement, indicating any discrepancies. See related comments in Section 23 05 13, Part 1 under Electrical Coordination.

E. Include wiring diagrams of electrically powered equipment.

F. Submit the quantity of shop drawings as specified under the Division 01 Specification Section titled “Submittals.”

G. Submittals shall be legible, clear and complete. Shop drawings submitted that are incomplete, illegible or are not specific to the project will be returned as “not reviewed”. In addition, equipment installed without having approved shop drawings will be considered defective and shall be removed and replaced with approved equipment at no expense to the project.

1.14 SPECIFIED MATERIALS AND EQUIPMENT

A. The design is based on the equipment specified by the manufacturer and model number as specified on the plan schedules. Where certain items are specified by manufacturer or trade name, Contractor's bid shall be based on use of the named item. Where one make is described and other makes are listed, comparable models of other named equipment may also be used, provided that they meet all requirements of the specifications.

B. When equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those on the plan schedules, the Contractor shall be responsible for costs involved in integrating the equipment or accessories into the system. The Contractor shall also be responsible for obtaining the original design performance from the system into which these items are placed, regardless of whether the manufacturer/model is a specified equivalent or a substitute. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

C. If the Contractor wishes to use items other than those named in specifications in his base bid, request for approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids. Including complete technical and descriptive data with the request. If approved, an addendum will be issued notifying all planholders of the approval.

1.15 EQUIPMENT INSTALLATION

A. The drawings show the general arrangement and location of equipment and appurtenances. It is the Contractor’s responsibility to install equipment in a location and manner that allows for proper service and maintenance access to equipment. Work shall generally conform to requirements shown on the

drawings. However, the location of equipment may require field adjustments to obtain the required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment. Also, because of the scale of the drawings, it is not possible to indicate the exact routing of ductwork and piping, and offsets, fittings and accessories that may be required to provide proper service access to equipment. The Contractor shall route and install ductwork and piping to provide required service access to equipment.

B. If during the construction phase of the project the contractor feels that inadequate space exists, or that equipment locations must be substantially modified to provide the proper service and maintenance access, prior to installing the equipment the contractor shall notify the engineer in writing, outlining the general concerns and the proposed modifications. Equipment installed without providing the manufacturer's required maintenance and service clearance shall be considered defective. The Contractor shall remove and relocate piping, ductwork and equipment, to provide the required service clearances at the Contractor's expense.

1.16 OFF SITE STORAGE

A. Refer to Division 01 of the Project Manual.

1.17 CERTIFICATES AND INSPECTIONS

A. Refer to the General Conditions of the Contract, Article 13.

B. Obtain and pay for required Federal, State and local installation inspections, certificates and permits required, except those provided by the Architect/Engineer in accordance with State and local Codes. Deliver originals of these certificates to the Architect or Construction Manager.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01 of the Project Manual.

B. Provide HVAC systems and equipment operation and maintenance manuals in accordance with the requirements of the project specification.

C. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:
   1. Copies of all approved shop drawings.
   2. Manufacturer's instructions for installation, operation, and maintenance.
   3. Manufacturer's wiring diagrams for electrically powered equipment.
   4. Records of tests performed to indicate compliance with system requirements (system start-up reports).
   5. Temperature control record drawings and control sequences.
   6. Parts lists for manufactured equipment.
   7. Valve schedules.
   8. Lubrication instructions, including list/frequency of lubrication done during construction.
   9. Warranties.
   10. Testing, adjusting and balancing data.

1.19 TRAINING OF OWNER PERSONNEL

A. Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as part of this project, using the Operating and

Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for equipment. Training shall be during normal working hours.

1.20 RECORD DRAWINGS

A. Refer to Division 01 of the Project Manual.

B. Maintain record drawings on a daily basis to be turned over at the completion of the project.

C. Maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.21 PROJECT CLOSEOUT

A. Refer to Division 01 of the Project Manual.

B. The Contractor shall complete and provide items and materials, training and start-up associated with project closeout as specified under Division 1 of the Project Manual. In addition to these items, the Contractor shall provide the following items prior to acceptance of the installation.
   1. Final air and water system balancing, completed in accordance with the requirements of Section 23 05 93 and code, including the submission of testing, adjusting and balancing reports. Reports shall indicate the amount of total supply air, return air and outside ventilation air being provided to the spaces and to the air handling system(s).
   2. Submission of Operating and Maintenance instructions in accordance with the requirements of Division 01, of this Section and code. Operation and maintenance manuals shall include a copy of the completed testing, adjusting and balancing report for the Owner's records.
   3. Submission of start-up report for the temperature control system, signed by the technician in responsible charge of the control system, indicating that the system has been adjusted, calibrated and put into operation in accordance with the requirements of the specification and code.

PART 2 - PRODUCTS

2.1 PIPE PENETRATIONS

A. FIRE, SMOKE AND FIRE/SMOKE RATED SURFACES
   1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.
   2. UL listed or tested by an independent testing laboratory, approved by the State and Local Code jurisdictions. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Sleeves in concrete to be schedule 40 steel pipe with integral water stop unless the fire stop material used includes a sleeve that is an integral part of the rated assembly.

B. NON-RATED SURFACES
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.

2. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and the cored opening or a water-stop type wall sleeve.
3. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effect the seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

2.2 IDENTIFICATION

A. STENCILS
1. Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. ENGRAVED NAME PLATES
1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply ® Style 2060 by Seton Name Plate Company, Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

C. VALVE TAGS
1. Round brass tags with ½ inch numbers, ¼ inch system identification abbreviation, 1¼ inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady.

D. PIPE MARKERS
1. At least ¾" high legend for piping under 3" diameter and at least 2" high legend for piping 3" diameter and larger. Include flow arrows. Manufacturers: W.H. Brady Co., EMED Co. or Seton Name Plate Company.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. Refer to Division 01 requirements.

B. This Contractor shall be responsible for cutting and patching of the existing general construction to accommodate installation of the new HVAC system(s) unless otherwise noted.

C. Patching includes repairing the openings remaining from the removal or relocation of existing system components and painting the surface to match existing. Painting means covering the entire wall where patching is to be done unless indicated to be done by other trades.

D. Required cutting and patching shall be performed by personnel skilled in cutting and patching work.

E. Do not pierce, modify or affect beams or columns without permission of the Architect/Engineer. If piping is required to pass through walls or floors where no sleeve has been provided, use a core drill to avoid unnecessary damage and structural weakening.

3.2 PAINTING

A. Refer to Division 9 requirements.

B. Exposed steel support structures (metal surfaces located both inside and outside the building) shall be painted after installation with one coat of a compatible metal primer coat and two coats of a finish coat of paint for the application. Color shall be gray unless otherwise specified.

C. Piping systems shall be clearly identified after painting with pipe markings as specified under the paragraph titled identification under this section.

3.3 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of equipment and materials. When building access was not previously arranged and must be provided by this contractor, restore opening to its original condition after the apparatus has been brought into the building. Coordinate with the Architect/Engineer.

3.4 EQUIPMENT ACCESS

A. Install piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for equipment and specialties. Where access is required in plaster walls or ceilings, furnish and install access doors required. Coordinate for installation of access doors utilizing the General Contractor and other appropriate on-site Subcontractor for access door installation.

B. Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings.

3.5 COORDINATION OF WORK

A. Verify that devices are compatible for the surfaces on which they are used. This includes, but is not limited to, diffusers, registers, grilles, and recessed or semi-recessed heating and cooling terminal units installed in/on architectural surfaces.

B. Coordinate work with other contractors prior to installation. Installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Verify system completion prior to start of the testing and balancing. Work to be completed prior to testing and balancing shall include, but not be limited to the following: flushing, pressure testing, chemical treatment, filling of hydronic systems, proper pressurization and air venting of hydronic systems, cleaning and replacement of filters, cleaning of strainers, duct and pipe system cleaning, adjusting and calibration of controls, controls cycled through their sequences. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls for fully functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work. Provide the appropriate sections of work with required wall, roof and floor opening locations and dimensions. If this Contractor neglects to coordinate this information, openings shall then be the responsibility of this Contractor.

3.6 PIPE PENETRATIONS

A. GENERAL

1. Coordinate the location of building surface penetrations with the appropriate contractors. Furnish sleeves, inserts, and other devices that

are to be built into the structure to the contractor performing that work. Prepare shop drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until shop drawings are approved.

B. FIRE RATED SURFACES
1. Install products in accordance with the manufacturer's instructions where a pipe penetrates a fire rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier. Where a sleeve must be installed in an existing floor, grout area around sleeve to restore the floor integrity.

C. NON-RATED SURFACES
1. Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when the insulation completely covers the wall opening and the insulation end is trimmed in a neat manner. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
2. In exterior wall openings below grade, place water-stop type wall sleeve before concrete pour or core drill opening after the pour. Assemble rubber links to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.
3. Install the galvanized sheet metal sleeve in hollow wall penetrations to provide a backing for the sealant. Apply sealant to both sides of the penetration in a manner that the annular space between the pipe sleeve and pipe or insulation is completely blocked.
4. Completely seal pipe penetrations, as specified below, for walls of the following rooms below:

3.7 CLEANING

A. Contractor shall at all times keep premises free of waste or surplus materials, rubbish and debris which is caused by his employees or resulting from his work.

B. After equipment and fixtures have been installed, Contractor shall remove all stickers, stains, labels and temporary covers.

C. All foreign matter shall be removed from pipes, tanks, pumps, fans, motors, devices, switches, fixtures, panels and ductwork before acceptance of systems.

D. Contractor shall leave his portion of the work in a safe and clean condition ready for operation.

E. In case of dispute, Owner may remove rubbish, excess materials or do cleaning, and charge the cost to Contractor.

3.8 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms and above ceilings, including terminal heating devices by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment in occupied spaces (for example cabinet heaters and ceiling fans).

B. Identification plates on equipment shall be free of excess paint and shall be legible.

C. Where stenciling is not appropriate for equipment identification, engraved nameplates shall be used.

D. Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

E. Identify valves with brass tags bearing system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms shall be framed under clear plastic.

F. Use engraved nameplates to identify control equipment and motor starters. Motor starters shall be provided with an engraved nameplate identifying the piece of equipment it serves by plan identification (i.e. "AHU-1").

G. Identify all fire and smoke dampers. Dampers shall be permanently identified on the exterior of the duct with a label (or painted) having a minimum letter height of 1”. Identification shall read either ”FIRE DAMPER”, “ SMOKE DAMPER” or “FIRE/SMOKE DAMPER”.

3.9 LUBRICATION

A. Lubricate bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the Owner accepts the work. Maintain a log of all lubricants used and frequency of lubrication. Include this information in the Operating and Maintenance Manuals at the completion of the project.

3.10 PROJECT CLOSEOUT

A. Contractor shall provide the following submittal data prior to final site walk-through review (found on next page). If this closeout work is not completed or is inaccurately completed, the Contractor shall be responsible for the expense of additional site reviews made by A/E.

END OF SECTION

CLOSEOUT DATA SUBMITTALS
Record drawing submission
Air and water balance test reports
Operating and maintenance manuals
Instructional walk-through and training
Piping and valve identification charts
Inspectors test reports - HVAC inspector
Pipe pressure test report - - Refrigerant leak test
System startup reports - Cooling equipment - Temperature control equipment
Closeout statements - Work completion - Warranty statements - Punch list completion

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section includes requirements for single and three phase motors that are used with equipment specified in other sections. Also included are general requirements for electrical wiring and electrical connections. Included are the following requirements:

1.2 RELATED WORK

A. Section 2305 00 – Common Work Results for HVAC

B. Section 23 09 23 – Direct Digital Control Systems for HVAC

C. Division 26 – Electrical

D. All electrical and temperature control wiring installation shall conform to the requirements of the applicable electrical sections of these specifications.

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI/NFPA 70 National Electrical Code

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Submit shop drawings for motors and motor starters.

B. Submit wiring diagrams for motors and HVAC equipment requiring wiring by the Electrical Contractor for this project. Wiring diagrams shall be prepared by the Contractor specifically for this work.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Include manufacturer's instructions in the manuals with the specific equipment to which they apply. Also include the following information if not previously documented on shop drawings: full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.8 ELECTRICAL COORDINATION AND GENERAL REQUIREMENTS

A. All starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, push-buttons, pilot lights, and other devices required for the control of motors or electrical equipment will be furnished and installed by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

B. The drawings and specifications show number and horsepower rating of motors furnished by this Contractor, together with their actuating devices if these devices are furnished by the HVAC Contractor. Any discrepancy in size, horsepower rating, electrical characteristics, or means of control for motors or other electrical equipment after contracts are awarded, and shall be addressed with the A/E.

C. Costs involved in changes required due to equipment substitutions initiated by this contractor will be the responsibility of the contractor. See related comments in Section 23 05 00, Basic HVAC Requirements, under Submittals.

D. The Contractor shall be responsible for providing control wiring (line and low voltage) for the project unless noted otherwise, including but not exclusive of the following:
   1. Interlock wiring of line and low voltage motorized automatic dampers associated with fans.
   2. Fire/Smoke and smoke damper actuators

E. Furnish project specific wiring diagrams to Electrical Contractor for equipment, starters and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor.

F. Provide on the front enclosure face of starting equipment, selector switches and push-buttons stations, a securely mounted, laminated plastic engraved name plate which shall identify the motorized equipment served by the respective starter. The name tags shall be constructed of black and white plastic (black face and white lettering) with ¼" high lettering. The lettering shall identify the unit served by the plan identification mark (example: "Exhaust Fan EF-1").

1.9 PRODUCT CRITERIA

A. Motors to conform to applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by UL for the service specified.

B. Select motors for conditions in which they will be required to perform; i.e., general purpose, splash-proof, explosion proof, standard duty, high torque or other special type by the equipment or motor manufacturer's recommendations and as specified on the drawings and as specified herein.

C. Furnish motors for starting in accordance with utility requirements and with compatible starters as specified.

PART 2 - PRODUCTS

2.1 MOTORS

A. SINGLE PHASE, SINGLE SPEED MOTORS
   1. Use NEMA rated 120 volt, single phase, 60 hertz motors for motors 1/3 HP and smaller.
   2. Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class B insulation. Service factor to be not less than 1.35. Motors are to be provided with internal overload protection.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

A. Lubricate motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for supports of HVAC equipment and materials as well as piping system hangers and anchors.

1.2 RELATED WORK

A. Section 23 07 00 – HVAC Insulation

1.3 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.4 REFERENCE STANDARDS

A.	U.L.	Underwriters Laboratory
B.	MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
C.	MSS SP-69	Pipe Hangers and Supports - Selection and Application
D.	MSS SP-89	Pipe Hangers and Supports – Fabrication & Installation Practices
E.	MSS SP-90	Guidelines on Terminology for Pipe Hangers and Supports

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 DESCRIPTION

A. Provide supporting devices for the installation of mechanical equipment and materials. Supports and installation procedures are to conform to the latest requirements of the ANSI/ASME Code for pressure piping.

B. Do not hang mechanical items directly from a metal deck or run piping so it rests on the bottom chord of trusses or joists.

C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

D. Protect insulation at hanger points; see Related Work above.

1.7 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Piping supported by laying on the bottom chord of joists or trusses is not acceptable.

PART 2 - PRODUCTS

2.1 STRUCTURAL SUPPORTS

A. Provide supporting steel for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels and beams to suspend or floor support tanks, piping, and other HVAC equipment.

2.2 PIPE HANGER AND SUPPORT MANUFACTURERS

A. Grinnell figure numbers are listed below. Equivalent products by B-Line, Fee and Mason, Kindorf, Michigan Hanger or Unistrut are acceptable.

2.3 PIPE HANGERS AND SUPPORTS

A. Black hangers are specified below. Substitute equivalent galvanized hangers for use in wet areas or areas that are frequently washed down.

B. STEEL PIPING SYSTEMS OPERATING AT 250°F OR LESS
   1. Hangers for Pipe sizes ½" through 2½": Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 or 260
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.
   2. Hangers for Pipe sizes 3" and over: Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 260
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.
      a. Grinnell Figure 46.
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.

C. INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 with Grinnell Figure 167 insulation protection shield for each hanger.
   2. Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.
      a. Grinnell Figure 46 with Figure 167 insulation protection shield at each hanger location.

D. UN-INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel with copper finish and adjustable clevis.
      a. Grinnell Figure CT-65
   2. Vertical Riser Support: Carbon steel riser clamp with copper finish.
      a. Grinnell Figure CT-121

2.4 BEAM CLAMPS

A. MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of *3/8*, ½, and *5/8* inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Grinnell Figure 86.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place for rod sizes to 1½ inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Grinnell Figure 228.

2.5 PIPE HANGER RODS

A. Steel Hanger Rods
   1. Threaded both ends, threaded one end, or continuous threaded, black finish.
   2. Size rods for individual hangers and trapeze support according to the following schedule.
   3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.)	Rod Diameter (Inches)
610	3/8
1130	1/2

   4. Provide rods with adjusting and lock nuts.
   5. Maximum temperature shall not exceed 650°F.

2.6 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install supports to provide for free expansion of the piping and duct system. Support piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

B. Coordinate hanger and support installation to properly group piping of other trades.

C. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and data is submitted for prior approval.

D. Piping over 1 ¼" shall be attached so that weight is carried on the top chord of steel bar joists or purlins.

3.2 HANGER AND SUPPORT SPACING

A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

C. Support riser piping independently of connected horizontal piping.

D. Adjust hangers to obtain the slope specified in the piping section of this specification.

E. SPACE HANGERS FOR PIPE AS FOLLOWS

Pipe Material	Pipe Size	Max. Horizontal Spacing	Max Vertical Spacing
Steel	½" through 1¼"	6' - 0"	15‘ – 0”
Steel	1½"	8' - 0"	15’ – 0”
Steel	2" through 4"	10' - 0"	15’ – 0”
PVC	All sizes	4' - 0"	10’ – 0”
Copper	½" through 1"	6' - 0"	10’ – 0”
Copper	1¼" and larger	10' - 0"	10’ - 0”

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for air testing, adjusting and balancing (TAB) specifications for the entire project. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC submittals to be furnished for use by the testing and balancing agency for coordination of work.

B. Project drawings and specifications which define the scope of the systems to be balanced.

1.3 REFERENCE

A. Provisions of Division 1 govern work under this section.

1.4 REFERENCE STANDARDS

A. AABC — National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Fifth Edition, 1989.

B. ASHRAE — ASHRAE Handbook, 1987 HVAC Systems and Applications, Chapter 57, Testing Adjusting and Balancing.

C. NEBB — Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Latest Edition.

1.5 QUALITY ASSURANCE

A. Testing, adjusting and balancing of new and existing air and water systems, including electrical measurement and verification of performance of equipment shall be completed in accordance with standards published by AABC or NEBB.

B. Air balancing work shall be completed by an AABC or NEBB certified air balance contractor. Certification number and seal of registration shall be included with each balancing report.

1.6 DESCRIPTION

A. Provide mechanical systems testing, adjusting and balancing. Requirements include the balancing of air systems, including adjustment of new and existing systems to provide design quantities as specified on the drawings, electrical measurement and verification of performance of equipment.

B. Test, adjust and balance air and hydronic systems so that each room, piece of equipment or terminal device is using the quantities indicated on the drawings and in the specifications.

C. Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule

established for this project. Coordinate with other sections of work as specified to provide timely and accurate completion of the TAB work.

D. The test and balance agency is encouraged to make periodic site visits to make sure that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

1.7 COORDINATION

A. The testing, adjusting and balancing Contractor shall coordinate his work with the mechanical system and temperature control system installing Contractors to accomplish coordination and verification of system operation and readiness for testing, adjusting and balancing.

1.8 SUBMITTALS

A. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The reports to be certified prove that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

B. Submission
   1. Submit 5 sets of reports for distribution. Final distribution of submittals shall be as follows:
      a. Owner — 3 copies for record purposes after approval (to be included in the operation and maintenance manuals).
      b. Project Architect — 1 copy for record purposes after approval.
      c. Project Engineer — 1 copy for record purposes after approval.
      d. Contractor — 1 copy for record purposes after approval.
   2. Include a copy of the approved final balancing report for this project.

C. Format
   1. Bind report forms in three-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions, separated by divider tabs:
      a. General Information
      b. Summary
      c. Air Systems
      d. Special Systems

D. Contents
   1. Provide the following minimum information, forms and data:
      a. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
      b. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are

design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.

c. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely including the percent deviation from design values. Where information cannot be obtained or is not applicable indicate same.

PART 2 - PRODUCTS

2.1 INSTRUMENTATION

A. Provide required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements are to be in accordance with the requirements of NEBB or AABC Standards and instrument manufacturer's specifications.

B. All instruments used for measurements shall be accurate, and calibration histories for each instrument shall be available for examination upon request. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES

A. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation.

B. Do not proceed until systems are fully operational with components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.2 PERFORMING TESTING, ADJUSTING AND BALANCING

A. Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.

B. Unless specifically instructed in writing, work specified in this section is to be performed during the normal workday.

C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tiles for tiles that are damaged by this procedure. If the ceiling construction requires the installation of access panels for completion of work under this section, provide panels for access as necessary.

D. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

E. In air systems employing filters, blank off filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

F. Adjust equipment to yield specified total flow at terminals. Proceed taking measurements in mains and branches for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

G. Determine air handling system total supply and return airflow and return and exhaust fan total airflow at each piece of equipment utilizing a pitot tube duct traverse. Summation of air terminal inlet/outlet CFM's is not acceptable, unless a pitot tube traverse is impractical. If summation of the air inlets/outlets is used in lieu of the traverse method, a valid explanation shall be submitted along with the balancing reports. Insufficient back-up information to support use of the summation method is cause for rejection of the balancing reports without review.

H. Measure and record airflow and static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units. Submit a static pressure profile for each air handling unit system. Unit static pressure profile shall be done at both minimum outside air CFM and at maximum outside air CFM (full economizer cycle) and also with the face and bypass dampers (when provided on air handling systems) in full bypass position as well as full face position. Reports submitted without air handling system static pressure profiles is cause for rejection of the balancing reports without review.

I. Final air system measurements to be within the following range of specified CFM:
   1. Fans -5% to +10%

J. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

K. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

L. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.3 DEFICIENCIES

A. Contractor shall correct installation deficiencies found during the test and balance stage. Test and balance agency shall notify the Construction Representative of these items.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. This section includes insulation specifications for heating, ventilating, and air conditioning piping, ductwork, and equipment.

1.2 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A.	ASTM/ANSI C195	Mineral Fiber Thermal Insulation Cement
B.	ASTM/ANSI C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
C.	ASTM/ANSI C547	Mineral Fiber Preformed Pipe Insulation
D.	ASTM/ANSI C553	Mineral Fiber Blanket and Felt Insulation
E.	ASTM/ANSI C612	Mineral Fiber Block and Board Thermal Insulation
F.	ASTM B209	
G.	ASTM E84	Surface Burning Characteristics of Building Materials
H.	NFPA 225	Surface Burning Characteristics of Building Materials
I.	MICA Manual	National Commercial & Industrial Insulation Standards, 1988, Third Edition, published by the Midwest Insulation Contractors Association
J.	UL 723	Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Label insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.6 DESCRIPTION

A. Furnish and install insulating materials and accessories as specified. The following types of insulation are specified in this section:
   1. Pipe insulation
   2. Duct Insulation

B. Install insulation materials in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Engineer.

1.7 DEFINITIONS

A. "Concealed"
   1. Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

B. "Unconditioned spaces"
   1. Unheated or non-cooled attics, utility tunnels and crawl spaces were ambient temperatures may rise above 90℉, or drop below 50°. Ducts in these instances are considered to be located outside of the building thermal envelope.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less except that outdoor mechanical insulation may have a flame spread rating of 75 and a smoke developed rating of 150.

2.2 INSULATION AND JACKETS

A. MANUFACTURERS:
   1. Armstrong, Halstead, Owens-Corning, Johns-Manville, Knauf, Certainteed or equivalent to types as specified herein.
   2. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be capable of receiving jackets, adhesives and coatings for the required application.
   3. Jackets shall have puncture resistance based on ASTM D-781 test methods. Vapor barriers, where required, shall have perm ratings based on ASTM E-96 procedure A.

B. FLEXIBLE FIBERGLASS INSULATION
   1. Owens-Corning "All-Service Duct Wrap" or Johns-Manville "R" Series Microlite with a minimum density of 0.75 lb. per cu. ft., thermal conductivity of not more than 0.35 at 75°F mean temperature, and be suitable for an operating temperature up to 250°F. Vapor retarder facing shall be a foil-scrim-kraft laminate jacket, factory applied to the insulation. Permeance shall not exceed 0.02 perms when tested in accordance with ASTM E 96. Beach puncture resistance shall be 50 units minimum.

C. RIGID FIBERGLASS INSULATION - PIPING
   1. Owens-Corning SSL-II having a thermal conductivity of not more than 0.23 at 75°F mean temperature and a maximum operating temperatures of 450° F.
   2. Jacket: White kraft reinforced vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap,

maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 50 units.

2.3 ACCESSORIES

A. Products shall be compatible with surfaces and materials on which they are applied, and be compatible for use at operating temperatures of the systems to which they are applied.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not insulate systems or equipment that is specified to be pressure tested or inspected, until testing and inspection have been successfully completed.

B. Piping, ductwork, and equipment shall be installed with clearances from walls, piping, ductwork, equipment and other obstacles to permit the application of the full thickness of insulation as specified.

C. Insulation, jackets, or accessories shall only be installed under ambient temperatures or conditions recommended by the manufacturer of the material.

D. Insulation and jackets shall be provided as specified in the listings contained within this specification section, or as otherwise noted on the plans. Requirements apply to both exposed and concealed applications unless noted otherwise.

E. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled terminations at nameplates, uninsulated fittings, and at other locations where insulation terminates.

F. Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation will not be accepted.

G. Provide removable insulation sections to permit easy access where inspection, service, or repair is required.

H. Install jackets with longitudinal joints facing wall or ceiling.

I. Insulation shall be continuous through sleeves and openings except where partitions or assemblies are fire rated. Penetrations through rated assemblies shall be sealed with fireproofing insulation.

J. Provide a continuous vapor barrier for insulation on the following systems:
   1. Refrigerant
   2. Equipment with a surface temperature below 65° F.

3.2 PIPING, VALVE AND FITTING INSULATION

A. Fittings and valves may be insulated with factory molded "Zeston" type covers, or built up insulation. Built up insulation must have the same thickness as adjoining insulation.

B. One piece, insulated PVC covers may be used for fittings and valves if insulation thickness and thermal performance is the same as adjoining insulation. Seams, joints between PVC cover and adjoining pipe insulation, and any staples or tacks

used to secure seams in PVC covers, must be covered with 2 inch wide, 10 mil PVC tape and one coat of vapor barrier mastic.

C. Provide inserts of high density block insulation at hanger or support locations. Block insulation to be preformed for the pipe size and cover the bottom 180 degrees of the pipe. Insert must be installed under the finish jacket on piping 2 inches and larger to prevent insulation from sagging or compressing at support points. Inserts shall be heavy density insulating material acceptable for the operating temperature range of the system being insulated. Wood blocks and block insulation cut into strips will not be accepted. Insulation inserts shall not be less than the following lengths:

Pipe Size	**Length**
Through 2½"	10"
3" to 6"	12"

D. Insulation shall be applied to piping with butt joints and longitudinal seams closed tightly.

E. Minimum acceptable lap on factory applied jackets shall be 2 inches, firmly cemented with lap adhesive.

F. Joints shall be covered with factory furnished tape (2" minimum width) to match the jacket, firmly cemented with lap adhesive.

G. Insulation, except that with vinyl jackets, shall be additionally secured to piping with the use of staples. Where staples are used on systems that require a vapor barrier, the lap and staples must be covered with a finish coat of vapor barrier mastic.

H. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Provide neatly beveled terminations. Poorly fitted terminations or use of filler in voids will not be accepted.

I. Where anchors or supports are secured directly to the pipe, extend insulation up the anchor or support for a distance of 4 times the insulation thickness. Maintain vapor barrier where insulation is terminated.

J. Couplings for mechanical grooved pipe must be insulated in the same manner as the adjoining pipe.

K. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints. Insulation for valves, unions, strainers, flexible connections and expansion joints shall be removable for inspection and repair.

L. Provide insulation as specified in the following schedule for all [new] [new and existing] piping:

Service	**Insulation**	**Insulation Thickness by Pipe Size**				
		Type1" and smaller	**1¼" to 2"**	**2½" to 4"**	**5" to 6"**	**8" and larger**
Refrigerant Suction	rigid fiberglass	1"	1½"	1½"	1½"	1½"
Cooling Coil Condensate	rigid fiberglass	1"	1"	1"	1"	1"

3.3 END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, exposed supply and return.

B. Related Section:

1. Section 233113 "Metal Ducts" for duct liner.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include completed plates from the National Commercial & Industrial Insulation Standards Manual (Volume 6 or later edition) for the following applications:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. See metal duct specification for duct liner requirements.

B. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

A. 1 and 2 Hour; zero clearance Applied Fire Protection for Commercial Kitchen Grease Ducts when tested in accordance with ASTM E 2336 – Passes all 5 Acceptance Criteria in Sections 16.1 to 16.5 – Reference ICC-ES Building Code Report ESR 2213 or ESR 2832, also reference UL Listing HNKT G-18.

B. 1 and 2 Hour Applied Fire Protection when tested in accordance with UL 1978; Compliant per Intertek Listing TC/BI 120-01.

C. 1 and 2 Hour F- and T-Rated Through Penetration Firestop when tested in accordance with ASTM E 814 (UL 1479): UL Through Penetration listings; C-AJ-1562; C-AJ-7004; C-AJ-7012; C-AJ-7014; C-AJ-7019; C-AJ-7021; C-AJ-7047; C-AJ-7095; C-AJ-7098; C-AJ-7119; F-A-1093; F-A-1094; F-A-3048; F-C-7036; FC-7037; W-L-7041; W-L-7099; W-L-7121; W-L-7145; W-J-7086.

D. 1 and 2 Hour Applied Fire Protection for Ventilation Air Duct when tested in accordance with ISO 6944-1985 - Reference UL Listings HNLJ V19; HNLJ V29;

E. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Products:

a. CertainTeed Corp.; FlameChek.
b. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
c. Thermal Ceramics; FireMaster XL.
d. 3M; Fire Barrier Wrap Products.
e. Unifrax Corporation; FyreWrap.

F. Access Doors (Fire Rated): Thermal Ceramics FastDoor XL (or equal) for duct access to Type 1 commercial kitchen hood exhaust ductwork: Install access openings at each change in direction and at intervals as required by code. Insulation cover system shall be tested and listed by UL (HNKT G18) to provide zero clearance to combustible construction and [1] [2]-hour fire rating per ASTM E 2336. Duct access cover panel shall be tested and listed by UL (YYXS.MH47995) with integral neoprene gasket to provide liquid tight seal and shall have a high temperature gasket and signage “Access Door – Do not Obstruct” compliant to code and NFPA 96. Installation shall be performed by an experienced contractor per manufacturer instructions and applicable UL Listings. Sheet metal and insulation contractors shall coordinate installation of the FastDoor XL and the duct enclosure system.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for ducts.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
    b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

D. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

E. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white or stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Polyguard Products, Inc.; Alumaguard 60.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick3/4 inch (19 mm) wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: Copper or zinc-coated, low-carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: Copper or zinc-coated, low-carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel aluminum stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Installation shall conform to the National Commercial & Industrial Standards Manual published by the Midwest Insulation Contractors Association (MICA). www.micainsulation.org

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

C. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Install insulation with longitudinal seams at top and bottom of horizontal runs.

F. Install multiple layers of insulation with longitudinal and end seams staggered.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation. Do not compress more than 25 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Roofing Contractor shall seal penetrations with flashing sealant. Duct penetrations must be completed and insulated before roof is sealed.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. General Contractor shall seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with insulation pins.

1. Install capacitor-discharge-weld pins and speed washers, or stick pins with speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
   b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Impale insulation over pins and attach speed washers.
   f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

3. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with insulation pins.

1. Install capacitor-discharge-weld pins and speed washers, or stick pins with speed washers, or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

3. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
4. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies.

D. Grease wrap installation:

1. Install 2 layers of FireMaster FastWrap XL or equal for a 1 and 2 hour commercial kitchen grease duct applications per ASTM E 2336.

2. General Installation Instructions for Double Layer Installations: The inside layer of FireMaster FastWrap XL blankets are cut to a length that will fit around the duct and meet with a tight butt joint. Adjacent blankets on the inside layer are tightly butted against each other. The outside layer is cut to a length that will fit around the duct and overlap itself no less than 3 inches (152 mm). Adjacent blankets on the outside layer overlap each other a minimum of 3", or they can be fitted together with a tight butt joint and covered with a 6 inches (305 mm) wide collar centered over the butt joint. Cut edges of the blanket shall be taped with aluminum foil tape to prevent exposed edges of the insulation from wicking of condensation moisture in air ventilation ducts or grease from a leaking grease duct joint. During installation the blankets are temporarily held in place with filament tape until the wrap is mechanically attached with steel bands or steel insulation pins.

3. Mechanical Fastening of Enclosure Material to Ductwork: Banding - Carbon steel or stainless steel banding is used to hold the outer layer of the blanket enclosure in place. Banding is minimum 1/2 inch (12.7 mm) wide, and is placed around the entire perimeter of the duct on maximum 10-1/2 inches (267 mm) centers and 1-1/2 inches (38 mm) from each blanket or collar edge.

4. Pinning - To prevent blanket sag on duct spans 24 inch wide (610 mm) or larger, minimum 12-gauge steel insulation pins are welded to the duct along bottom horizontal and outside vertical runs in columns spaced 12 inches (305 mm) apart, 6 to 12 inch (152 to 305 mm) from each edge, and on 10-1/2 inches (267 mm) centers. Pins are also required 1 inch (25 mm) from the end of a duct and 1 inch (25 mm) from any edge near a 90° bend spaced 6 inch (152 mm) apart. Pins are locked in place with 1-1/2 inch (38 mm) diameter or 1-1/2 inch (38 mm) square galvanized steel speed clips or cup head pins. Pins are turned down or the excess cut off to eliminate sharp edges.

5. Grease Duct Access Door Installation: Provide UL Listed liquid tight Thermal Ceramics FastDoor XL access doors where required by code. Sheet metal and insulation contractors shall coordinate installation of FastDoor XL.

3.7 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Painting Contractor shall paint jacket with paint system identified below where required by architect or engineer:

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

    a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

(When noted or specified to have no duct lining.)

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

C. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

D. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density. Apply insulation form fan discharge at exterior to 20'-0" along duct towards exhaust intakes.

E. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating. Two layers, 1-1/2 inches each per manufacturers installation guidelines.

F. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

G. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating. Two layers, 1-1/2 inches each per manufacturers installation guidelines.

H. Exposed ductwork in mechanical room shall be insulated with 2 inch thick 3-lb/cu. ft. ductboard with FSK.

I. Exposed round duct in mechanical room shall be insulated with 2.5-lb/cu.ft. microflex with FSK.

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option. Exterior ducts shall have aluminum jacket.

B. Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches (50 mmthick and 3-lb/cu. ft. (48-kg/cu. m) nominal density.

C. Return-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches (50 mm) thick 3-lb/cu. ft. (48-kg/cu. m) nominal density.

D. Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches (50 mm) thick and 3-lb/cu. ft. (48-kg/cu. m) nominal density.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket (where noted on plans).

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Exposed, up to 48 Inches (1200 mm) in Diameter or with Flat Surfaces up to 72 Inches (1800 mm):

1. Aluminum, Stucco Embossed: 0.020 inch (0.41 mm) thick.

D. Ducts and Plenums, Exposed, Larger Than 48 Inches (1200 mm) in Diameter or with Flat Surfaces Larger Than 72 Inches (1800 mm):

1. Aluminum, Stucco Embossed with 0.032 inch (0.81 mm) thick.

END OF SECTION

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

A. Work in this section includes Direct Digital Control (DDC) panels, field equipment panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete, fully functional Direct Digital Control (DDC) building automation system, utilizing Direct Digital Control signals to meet, in every respect, all operational and quality standards specified herein.

1.2 POINT CHARTS

A. Following this section.

1.3 REFERENCE

A. Applicable provisions of Division 01 shall govern work under this section.

1.4 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 09 93 – Sequence of Operation for HVAC Controls

C. Division 26 – Electrical

1.5 WORK OF OTHER SECTIONS

A. Power wiring for starters.

B. Furnishing of disconnect switches required by Code at motor locations.

C. Installing and wiring motor starters.

1.6 DEFINITIONS

A. The following definitions are applicable to work of this section:

1.	DDC	Direct Digital Control
2.	BAS	Building Automation System
3.	TCS	Temperature Control System
4.	TCC	Temperature Control Contractor
5.	I/O	Input/output Device
6.	FMS	Facility Management System
7.	LAN	Local Area Network
8.	DCU	Distributed Control Units
9.	ASC	Application Specific Controller

1.7 DESCRIPTION OF WORK

A. The extent of the work shall be as shown on the drawings, as shown in schedules and as detailed by the performance requirements specified hereinafter.

B. All necessary software, hardware, firmware, operating equipment, devices and system components required for the system shall be provided by the

Subcontractor whether or not specifically itemized, in order to provide a complete system within the intent of this specification.

C. All system point types shall be universal I/O. All hardware inputs shall be digital inputs or analog inputs (field selectable). All hardware outputs shall be digital outputs or analog outputs (field selectable). Float control will not be allowed unless true analog feedback is used on a per point basis.

D. It is the intent of this specification to describe a system utilizing the latest technology with an emphasis towards “connectivity”. The BAS system shall in no way hinder the ability of the Owner to purchase mechanical equipment of multiple equipment manufacturers at this time or in the future.

E. ALL exceptions to bid specifications shall be clearly listed with the BAS bid for Owner/Engineer review. ANY exceptions not listed shall bind the contractor to the full extent of the specifications. All questions and comments shall be directed in writing to the engineer.

1.8 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. MANUFACTURER
1. Provide principal direct digital temperature control equipment and materials as manufactured by a single manufacturer.

C. INSTALLER
1. All work shall be installed by mechanics and technicians directly employed by the automatic control system manufacturer who shall be responsible for the proper installation and operation of the automatic control system.
2. The Automatic Temperature Control Subcontractor shall maintain a local service office within a 75-mile radius of the job site, staffed with factory-trained engineers fully capable of providing instruction, routine maintenance, and emergency maintenance service on all system components.
3. The Subcontractor shall have a five-year experience record in the design and installation of systems of similar design, manufacture and performance to the automatic temperature control systems specified herein.

D. ELECTRICAL STANDARDS
1. Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

E. DDC Standards
1. DDC manufacturer shall provide written proof with shop drawings that the equipment being provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (1979 Amendment to Part 15, Subpart J).

1.9 SUBMITTALS

A. Submittals shall be required in two phases.

B. First phase (approval) submittals
1. First phase (approval) submittals, to be done on AutoCAD, shall include job-tailored shop drawings as detailed herein, individual catalog cut sheets detailing manufacturer's data for each major control system component listed under Section 4, "Materials and Equipment", general catalog for all

other minor control components and descriptive sequences detailing all automatic control system work. Generalized, standard catalog shop drawings shall not be used for first phase (approval) submittals. This Subcontractor shall develop a complete set of new shop drawings showing the entire automatic control system including the new digital automatic control system and the FMS system interface.

2. Each shop drawing shall be provided with a title block identifying the name of the project, the address of the project, the address of the Subcontractor, the shop drawing sheet number, the Subcontractor's in-house project identification number and the mechanical system reproof the latest revision made to the individual shop drawing.
3. Each mechanical system shall be represented by a line diagram showing each mechanical component (supply fans, heating coils, cooling coils, etc.) as well as any other mechanical system components present but not necessarily affected by the automatic control system (filters, etc.).
4. A line diagram representation of the respective mechanical system shall show all dampers in their relative locations (outside air ductwork, return air ductwork, etc.) and shall show all valves as they are intended to be connected to their respective mechanical component for proper operation.
5. A line diagram representation of the respective mechanical system shall also show all field-mounted automatic control system sensing and control components (sensors, transmitters, receiver-controllers, etc.) and all controlled devices (pressure-electric switches, electric-pressure solenoids, damper actuators, valve actuators, etc.).
6. All panel-mounted control components shall be shown within a separate section of the shop drawing designated for representation of the individual control panel and its face layout. Interconnecting pneumatic piping between panel-mounted components shall be shown. Interconnecting electrical wiring shall not be shown within the designated panel section of the shop drawing but shall be detailed in a one-line diagram (complete with terminal designations) on the same drawing.
7. All electrical wiring for starters of mechanical system components affected by the automatic control system (supply fans, exhaust fans, pumps, etc.) shall be represented as one-line diagrams showing all interlocks between the automatic control system, the respective starter and any other interlocks not necessarily provided as part of the automatic control system (fire alarm, smoke alarm, etc.).
8. Each shop drawing shall be accompanied by a typewritten listing identifying each control system component shown on that drawing. Each component shall be identified by the name used to designate the component on the shop drawings, the component's actual catalog description and designation (to be used when purchasing repair parts), the component's operating range, the component's fail-safe position, the component's setpoint (where applicable) and any other pertinent information.
9. Each shop drawing shall be accompanied by a typewritten sequence of operation identifying the designated function of each control component shown on that drawing. Each control component shall be identified in the sequence of operation by the name used to designate the component on the shop drawings.
10. Each sequence of operation detailing a control sequence involving more than one controlled device (damper operator, valve operator, etc.) shall be accompanied by a sequence graph identifying the relative position of the respective controlled device in the overall sequence (above and below the setpoint of the control loop controlling the respective device.)
11. First phase (approval) submittals shall be provided to and approved by the Owner's authorized representative before any job site installation work is performed.

C. Second phase (operation and maintenance) submittals

1. Second phase (operation and maintenance) submittals shall be provided after all installation, calibration and start-up work has been completed and shall include the first phase submittal shop drawings of the automatic control system, revised to reflect the system in its as-built condition, along with all information previously included in the first phase submittals.
2. Each second phase (operation and maintenance) submittal shall include a typewritten set of operating instructions identifying the procedures to be employed to perform such automatic control system operations as overriding the system, entering new setpoints, displaying current values of system parameters, displaying trend logs, etc.
3. Second phase (operation and maintenance) submittals shall also include information detailing preventive maintenance to be performed by the Owner on a regular basis and the Subcontractor's system guarantee and system component warranties.
4. All as-builts shall be on AutoCAD and both a hard copy and 3.5" disk shall be included with O&M manuals.

1.10 OPERATOR INSTRUCTION

A. During the commissioning phase of the BAS/TCS installation and at such time as acceptable performance of the overall system's hardware and software has been established, the BAS/TCS Subcontractor shall provide on-site operator instruction to the Owner's operating personnel.

B. On-site operator instruction shall be provided during normal working hours and shall be performed by competent representatives of the BAS/TCS Subcontractor familiar with the overall BAS/TCS software, hardware and accessories.

C. Provide at the time of instruction, three copies of the Owner's operation and maintenance manual, custom-prepared for this project by the BAS/TCS Subcontractor, which shall be used in conjunction with the instruction. Each copy of the Owner's manual shall be bound in a three-ring binder, labeled with the name and address of the project.

1.11 MATERIAL DELIVERY AND STORAGE

A. Provide factory-shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. The existing Johnson Controls Metasys systems will be extended to serve the new work.

2.2 TEMPERATURE SENSORS

A. Provide thermistor or thin film silicon sensors for all temperature applications, except differential chilled water for BTU calculation, where precision matched Platinum RTDs shall be used. Solid-state sensors shall be linear, drift free, and require only a one-time calibration. Thermistors, or similar non-linear temperature devices shall be linearized by a look-up table in the connected controller. Resolution shall be better than 0.5 degrees F for zone or terminal equipment applications, and better than 0.2 degrees F for DDC control unit applications.

2.3 ROOM SENSORS (THERMOSTATS)

A. Room thermostats shall be active DDC type space sensors/thermostats. Each thermostat shall have user setpoint adjustment and shall also have the capability to digitally display room temperature and room temperature setpoint. The thermostat/sensor display shall present the midpoint of the heating and cooling set points for normal operation to avoid user confusion. The thermostat shall communicate with the DDC system for both room temperature and room temperature setpoint. The room temperature setpoint shall be remotely adjustable via the DDC system. User adjustment shall have the capability of being locked out if so desired via the DDC system.

B. Room sensors shall have and adjustable deadband between heating and cooling points. Deadband range shall allow the sensor to be set with up to a 5°F deadband range.

C. For special applications, provide remote mounted, or duct mounted sensors as indicated on the plans.

D. Provide insulated subbase for all thermostats/sensors installed on outside walls or walls exposed to outside air temperatures.

E. Thermistor type room thermostats are not acceptable.

2.4 MISCELLANEOUS SENSORS

A. TEMPERATURE SENSORS
   1. Use nickel wire thermistor type temperature sensing elements constructed so that the accuracy and life expectancy is not affected by moisture or other conditions that exist in each application. Normal range to be 35°F to 100°F with accuracy of ± 0.5°F and a base resistance of 1000 ohms at 77°F.
   2. Provide limited range or extended range sensors if required to sense the range expected for a respective point.
   3. Use averaging elements on duct sensors.
   4. Use elements on sensors in piping systems compatible with installation in separable wells.

B. Room sensors
   1. Wall mounted with adjustable 2% RH range. Provide sensors in occupied spaces with covers to match those specified for thermostats.

PART 3 - EXECUTION

3.1 INSTALLATION

A. This Contractor shall provide all labor, materials, engineering, software permits, tools, check-out and certificates required to install a complete DDC automation system as herein specified. This system shall fully communicate through all I/O devices, central processing unit (CPU), and digital communication trunks. This digital communications trunk shall be true bi-directional analog and digital communications.

B. Any and all points on this project shall be grouped for display purposes into the system such that all points associated with the DDC system can appear together on the CRT display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. Each system shall be identified by an English descriptor and an alpha/numeric identifier.

C. This central campus automation system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and check-out necessary for a fully operational system.

D. All electronic work required as an integral part of the automation system work is the responsibility of this section unless specifically indicated otherwise in this section or in Division 16.

E. BAS vendor shall demonstrate the ability to upgrade 5 year of BAS hardware to operate with the latest release software revisions. This shall be done with "Firmware Chip" additions only. No integrators shall be allowed. A system expansion with lessor capabilities will not be accepted. This contractor shall provide evidence of having done five (5) similar installations and shall insure that the system installation will not alter the UL listing of the new system.

F. Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.

3.2 ELECTRICAL

A. All work and materials are to conform in every detail to the rules and requirements of the Wisconsin Electrical Code and present manufacturing standards. All material shall be UL approved.

B. This Contractor shall be responsible for all line voltage and low voltage electrical wiring incidental to the system installation.

C. All sensor and output wiring shall be shielded cable as required by the equipment manufacturer.

D. The field wiring connections of all field-mounted sensors shall be adequately protected by a junction box mounted at the point of measurement.

E. Separate conduit systems shall be provided for sensor wiring and high voltage (120 VAC) wiring.

F. All low voltage exposed wiring provided by this Contractor shall be enclosed in conduit (EMT). All line voltage provided by this Contractor shall be enclosed in conduit (EMT).

G. All conduit shall be secured at regular intervals and run parallel with the lines of the building.

H. Power to local temperature control panels shall be provided by the BAS Contractor.

I. DDC panels serving equipment fed by emergency power shall also be served by emergency power.

J. All line voltage wiring required to power the DDC Controllers shall be provided by BAS contractor.

K. BAS Identification Standards:
   1. Node Identification. All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.

2. Cable shall be labeled at a minimum of every 18" with the FMS System manufacturer's name and the type of signal carried within the cable, i.e. Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC.
3. Each of the cable types specified in Item A shall be of a different color coding for easy identification and troubleshooting. Recommended color coding:

a.	Analog Input Cable	Yellow
b.	Analog Output Cable	Tan
c.	Binary Input Cable	Orange
d.	Binary Output Cable	Violet
e.	24 VAC Cable	Gray
f.	General Purpose Cable	Natural
g.	Tier 1 Comm Cable	Purple
h.	Other Tier Comm Cable	Blue

L. Raceway Identification. All the covers to junction and pull boxes of the FMS raceways shall be painted with the appropriate color.

M. Wire Identification - all low and line voltage FMS wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

3.3 ROOM THERMOSTATS AND TEMPERATURE SENSORS

A. Check and verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate room thermostats 48 inches above floor. Align with light switches and humidistats.

B. Any room thermostats mounted on an exterior wall shall be mounted on a thermally insulated sub-base.

3.4 GRAPHICS

A. Upgrade the existing dynamic graphic representation to include all new work.

END OF SECTION

SECTION 23 09 93
SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes control sequences describing the manner in which the automatic control systems shall operate. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 09 23 – Direct Digital Control System for HVAC

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 SUBMITTALS

A. The following data/information shall be submitted for approval. This data shall be included with the balance of the Section 23 09 23 submittals:

1. Complete sequence of operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Refer to Section 23 09 23.

PART 3 - EXECUTION

3.1 CONTROL SEQUENCES - DESCRIPTION OF WORK

A. Control sequence is hereby defined to mean the manner in which, and methods by which, the automatic temperature control system shall function. The requirements for each type of operation are detailed in this section.

B. All necessary operating equipment, devices and system components required for the automatic temperature control system shall be provided by the Automatic Temperature Control Subcontractor whether or not specifically itemized, in order to install a complete automatic temperature control system within the intent of this specification.

C. The extent of the automatic temperature control system work shall be as shown on the drawings and by the control performance requirements as specified in this section.

D. In each equipment room, provide a minimum of 1 temperature control panel. The temperature control panel shall have a local control and interface display panel to monitor specified equipment alarms, reset values, equipment statuses and runtimes. Alarms and system points shall be capable of being viewed from this

location. Points shall also be able to be controlled or alarms acknowledged from this location.

E. The Temperature Control Contractor (TCC) shall provide and field install required sensors to provide the points as specified on the points lists, as well as additional sensors and points to provide the specified sequence of operation. For equipment that has a factory supplied microprocessor controllers (including, but not limited to chillers and packaged rooftop air conditioning equipment), provide the necessary interfaces and communication wiring as well as additional field installed sensors to monitor the specified points. These sensors may be either analog or binary depending on the application.

3.2 SPLIT SYSTEMS

A. SPLIT SYSTEM AIR CONDITIONING UNIT

1. Unit temperature control shall be provided by the integral microprocessor control system furnished by the unit manufacturer. This contractor shall be responsible for installing any remote thermostats and controllers and providing complete control wiring for the unit.
2. Provide all additional monitoring points as indicated in the points list.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for hydronic pipe and pipe fittings for this project.

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 07 00 – HVAC Insulation

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI A21.10 ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

B. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

C. ASTM A74 ASTM B75 Seamless Copper Tube

D. ASTM B88 Seamless Copper Water Tube

E. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order copper water tube with each length marked with the name or trademark of the manufacturer and type of tube; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier in accordance with ASTM B88.

C. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project.

D. Steel piping and fittings shall be manufactured in the United States.

1.6 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

1.7 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig and 250 degrees unless specifically indicated otherwise.

C. Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at Contractor's option.

PART 2 - PRODUCTS

2.1 CONDENSATE PIPING

A. Use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove foreign material from interior and exterior of pipe and fittings.

B. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. Consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

C. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment room.

D. All low points shall have a drain valve and capped hose thread outlet.

E. Main branches and runouts to terminal equipment may be made at the top, side, or bottom of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.

F. Connections at a main may be made from the bottom with a tee and a 45 degree elbow.

G. Use a minimum of three elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping

systems. Offset pipe connections at equipment to allow for service or removal of the terminal device.

H. Provide connections to chilled water coils, hot water coils, and terminal heating devices as shown on the drawings for a fully functional system.

3.2 COPPER PIPE JOINTS

A. Remove slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

3.3 COOLING COIL CONDENSATE

A. Trap each cooling coil drain pan connection with a trap seal. Depth of trap seal depth shall prevent conditioned air from moving through the piping. Extend drain piping to nearest code approved drain location. Construct trap with plugged tee for cleanout purposes. Do not provide loop seals for air handling systems with internal traps.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for refrigerant pipe and pipe fittings for this project.

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 07 00 – HVAC Insulation

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order copper refrigeration tube with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; with soft straight lengths or coils identified with a tag indicating that the product was manufactured in accordance with ASTM B280; and with each hard temper straight length identified throughout its length by a blue colored marking not less than 3/16 inch in height and a legend at intervals of not greater than three feet that includes the designation "ACR" and pipe outside diameter.

C. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project.

1.6 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing adequate ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements does not relieve the Contractor from using proper storage techniques.

1.7 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. ASTM B88 type L hard drawn copper tube, cleaned and capped in accordance with ASTM B280, and marked "ACR", with ANSI B16.22 wrought copper or forged brass solder-type fittings.

B. Provide factory furnished refrigerant tubing sets with the air conditioning units as specified in other sections of this specification.

2.2 VENTS AND RELIEF VALVES

A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove foreign material from interior and exterior of pipe and fittings.

3.2 ERECTION

A. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. Consult the plans for the location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Mitered ells and notched tees are not acceptable.

C. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

D. Install valves and piping specialties, including items furnished by other sections of work, as specified and as detailed. Make connections to equipment installed by other sections of work where that equipment requires the piping services indicated in this section.

E. Remove slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation and assemble joint.

F. Solder joints shall be ASTM Grade 4 or 5 and have a melting point of approximately 1250 degrees F. Solder impurities shall not exceed 0.15%. Tubing to be new and delivered to the job site with the original mill end caps in place. Clean and polish joints before soldering. Avoid prolonged heating and burning during soldering. Purge lines with nitrogen during soldering. Provide manual shut-off and check valves to permit system servicing.

G. No refrigerant is to be vented directly to the atmosphere except that which may escape through leaks in the system during leak testing. During evacuation procedures, use equipment designed to recover and allow recycling of the refrigerant.

H. Refrigeration piping to be installed by firms who are experienced in installation of refrigerant piping.

I. Refrigeration piping shall be installed in accordance with the requirements of the Wisconsin Administrative Code Section COMM 45.

3.3 VENTS AND RELIEF VALVES

A. Install vent and relief valve discharge lines as specified on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roofline.

3.4 PIPING SYSTEM LEAK TEST

A. Verify that the piping system being tested is fully connected to system components and that equipment is properly installed, wired, and ready for operation.

B. Leak test the system by charging the system to a pressure of 10 psig with an HFC refrigerant, with the compressor suction and discharge valves closed and with all other system valves open. Increase pressure to 300 PSIG with dry nitrogen. Rap joints with a mallet and check for leaks with an electric leak detector having a certified sensitivity of at least one ounce per year. Seal leaks and retest.

C. After completion of the leak test, evacuate the system with a vacuum pump to an absolute pressure not exceeding 1500 microns while the system ambient temperature is above 60°F. Break the vacuum to 2 PSIG with the refrigerant to be used in the system. Repeat the evacuation process, again breaking the vacuum with refrigerant. Install a drier of the required size in the liquid line, open the compressor suction and discharge valves, and evacuate to an absolute pressure not exceeding 500 microns. Leave the vacuum pump running for not less than two hours without interruption. Raise the system pressure to 2 PSIG with refrigerant and remove the vacuum pump.

D. Charge refrigerant directly from original containers through a combination filter-drier. Each drier may be used for a maximum of three cylinders of refrigerant and then must be replaced with a fresh drier. Charge the system by means of a charging fitting in the liquid line. Weigh the refrigerant drum before charging so that an accurate record can be kept of the weight of refrigerant put in the system. If refrigerant is added to the system through the suction side of the compressor, charge in vapor form only.

E. Do not insulate pipe until it has been successfully tested.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Double-wall round and flat-oval ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.
8. Seismic-restraint devices.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Exposed ductwork shall be free of defects and constructed of paint lock sheet metal.

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Exposed ductwork shall be free of defects and constructed of paint lock sheet metal.

2.3 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lindab Inc.
2. McGill AirFlow LLC.
3. SEMCO Incorporated.
4. Sheet Metal Connectors, Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
    b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Inner Duct: Minimum 0.028-inch (0.7-mm) perforated galvanized sheet steel having 3/32-inch-(2.4-mm-) diameter perforations, with overall open area of 23 percent.

E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

F. Exposed ductwork shall be free of defects and constructed of paint lock sheet metal.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction

methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils (0.10 mm) thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 1 mil (0.025 mm) thick on opposite surface.
3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

G. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

H. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

I. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.
e. Maximum Thermal Conductivity:

1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Solvent or Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA Inc.
b. Armacell LLC.
c. Rubatex International, LLC

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bonded Logic, Inc.
b. Reflectix Inc.

2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at75 deg F (24 deg C) mean temperature when tested according to ASTM C 518.

3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

    a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

E. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other

buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches (102 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet (3.7 m) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Painting shall be performed by Painting Contractor. Mechanical Contractor shall coordinate requirements with other trades.

B. Paint exposed ductwork as directed by Architect.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch wg (750 Pa): Test representative duct sections, selected by Engineer from sections installed, totaling no less than 25 percent of total installed duct area for each designated pressure class.
    b. Supply Ducts with a Pressure Class of 4-Inch wg (1000 Pa) or Higher: Test representative duct sections, selected by Engineer from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
    c. Return Ducts with a Pressure Class of 4-Inch wg (1000 Pa) or Higher: Test representative duct sections, selected by Engineer from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
    d. Exhaust Ducts with a Pressure Class of 2-Inch wg (500 Pa) or Higher: Test representative duct sections, selected by Engineer from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
    e. Outdoor Air Ducts with a Pressure Class of 4-Inch wg (1000 Pa) or Higher: Test representative duct sections, selected by Engineer from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel with thicker coating on duct exterior.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

   a. Pressure Class: Positive 1-inch wg (250 Pa.
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 12.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

   a. Pressure Class: Positive 2-inch wg (500 Pa).
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 6.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

   a. Pressure Class: Positive 4-inch wg (1000 Pa).
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 3.
   d. SMACNA Leakage Class for Round and Flat Oval: 3.

4. Ducts Connected to Equipment Not Listed Above:

   a. Pressure Class: Positive 2-inch wg (500 Pa).
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 12.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

   a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 12.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg (250 Pa).
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 3-inch wg (750 Pa).
e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
f. SMACNA Leakage Class: 3.

4. Ducts Connected to Dishwasher Hoods:

a. Type 304, stainless-steel sheet.
b. Exposed to View: No. 4 finish.
c. Concealed: No. 2D finish.
d. Welded seams and flanged joints with watertight EPDM gaskets.
e. Pressure Class: Positive or negative 2-inch wg (500 Pa).
f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
g. SMACNA Leakage Class: 3.

5. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:

a. Type 316, stainless-steel sheet.

1) Exposed to View: No. 4 finish.
2) Concealed: No. 2B finish.

b. PVC-coated, galvanized sheet steel with thicker coating on duct interior.
c. Pressure Class: Positive or negative 4-inch wg (1000 Pa).
d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.

e. SMACNA Leakage Class: 3.

6. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel
2. PVC-Coated Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

3. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

4. Aluminum Ducts: Aluminum.

G. Liner:
Note: Refer to drawings. Specific areas/locations may require additional thicknesses. These thicknesses are noted on plans where different from this specification.

1. Supply Air Ducts: Fibrous glass, Type I, 1 inch (25 mm) thick.
2. Return Air Ducts: Fibrous glass, Type I, 1 inch (25 mm) thick.
3. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch (25 mm) thick.
4. Supply Fan Plenums: Fibrous glass, Type II, 1 inch (25 mm) thick.
5. Return- and Exhaust-Fan Plenums: Fibrous glass, Type II , 1 inches (25 mm) thick.
6. Transfer Ducts: Fibrous glass, Type I, 1 inch (25 mm) thick.

H. Double-Wall Duct Interstitial Insulation:

1. Supply Air Ducts: 1-1/2 inches (38 mm) thick.
2. Return Air Ducts: 1 inch (25 mm) thick.
3. Exhaust Air Ducts: 1 inch (25 mm) thick.

I. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

   a. Velocity 1000 fpm (5 m/s) or Lower:

      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.

   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

   c. Velocity 1500 fpm (7.6 m/s) or Higher:

      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam or Welded.

J. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1500 fpm (5 to 7.6 m/s) or Lower: Conical tap.
b. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling radiation dampers.
7. Smoke dampers.
8. Combination fire and smoke dampers.
9. Flange connectors.
10. Duct silencers.
11. Turning vanes.
12. Remote damper operators.
13. Duct-mounted access doors.
14. Flexible connectors.
15. Flexible ducts.
16. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. Pottorff.
7. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm (5.1 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: Hat-shaped, 0.05-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Nonferrous metal.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage (1.0 mm) minimum.
    b. Sleeve Length: 6 inches (152 mm) minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.

3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. Pottorff.
7. Ruskin Company.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 1000 fpm (5.1 m/s).

D. Maximum System Pressure: 2-inch wg (0.5 kPa).

E. Frame: Hat-shaped, 0.05-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades:

1. Multiple, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
2. Maximum Width: 6 inches (150 mm).
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted.

G. Blade Seals: Neoprene.

H. Blade Axles: Galvanized steel.

I. Tie Bars and Brackets:

1. Material: Aluminum.
2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Synthetic or Stainless steel or Bronze.

L. Accessories:

1. Flange on intake.
2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
e. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:

a. Hat shaped.
b. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
c. Mitered and welded corners.
d. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick.

7. Blade Axles: Galvanized steel.
8. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.
12. Accessories:

a. Include locking device to hold single-blade dampers in a fixed position without vibration.

D. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
    d. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.

7. Blade Axles: Galvanized steel.
8. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.
12. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

E. Jackshaft:

1. Size: 0.5-inch (13-mm) diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.6 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff.
8. Ruskin Company.
9.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.

2. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches (152 mm).
2. Parallel- and opposed-blade design.
3. Galvanized-steel.
4. 0.064 inch (1.62 mm) thick single skin or 0.0747-inch- (1.9-mm-) thick dual skin.
5. Blade Edging: Closed-cell neoprene.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

F. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.7 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Prefco; Perfect Air Control, Inc.
9. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory-installed, galvanized sheet steel.

1. Minimum Thickness: 0.05 (1.3 mm) thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch- (0.61-mm) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.8 CEILING RADIATION DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Nailor Industries Inc.
4. Pottorff.
5. Prefco; Perfect Air Control, Inc.
6. Ruskin Company.

B. General Requirements:

1. Labeled according to UL 555C by an NRTL.
2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

F. Fire Rating: 1 or 2 or 3 hours. Refer to Code Plan requirements.

2.9 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection.

D. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

E. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.039-inch- (1.0-mm-) thick, galvanized sheet steel; length to suit wall or floor application[with factory-furnished silicone calking.

I. Damper Motors: Two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections.
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
7. Electrical Connection: 115 V, single phase, 60 Hz.

K. Accessories:

1. Auxiliary switches for signaling, fan control or position indication.
2. Test and reset switches, remote mounted.

2.10 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- (1.6-mm-) thick, galvanized sheet steel.

I. Leakage: Class I.

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 0.039-inch- (1.0-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

L. Master control panel for use in dynamic smoke-management systems.

M. Damper Motors: Two-position action.

N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections.
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
7. Electrical Connection: 115 V, single phase, 60 Hz.

O. Accessories:

1. Auxiliary switches for signaling fan control or position indication.
2. Test and reset switches, remote mounted.

2.11 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.12 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dynasonics.
2. Vibro-Acoustics.
3. Industrial Acoustics Company.

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Shape:

1. Rectangular straight with splitters or baffles.
2. Round straight with center bodies or pods.
3. Rectangular elbow with splitters or baffles.
4. Round elbow with center bodies or pods.
5. Rectangular transitional with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90 (Z275), galvanized sheet steel, 0.040 inch (1.02 mm) thick.

E. Round Silencer Outer Casing: ASTM A 653/A 653M, G90 (Z275), galvanized sheet steel.

1. Sheet Metal Thickness for Units up to 24 Inches (600 mm) in Diameter: 0.034 inch (0.85 mm) thick.
2. Sheet Metal Thickness for Units 26 through 40 Inches (660 through 1000 mm) in Diameter: 0.040 inch (1.02 mm) thick.
3. Sheet Metal Thickness for Units 42 through 52 Inches (1060 through 1300 mm) in Diameter: 0.05 inch (1.3 mm) thick.
4. Sheet Metal Thickness for Units 54 through 60 Inches (1370 through 1500 mm) in Diameter: 0.064 inch (1.62 mm) thick.

F. Inner Casing and Baffles: ASTM A 653/A 653M, G90 (Z275) galvanized sheet metal, 0.034 inch (0.85 mm) thick, and with 1/8-inch- (3-mm-) diameter perforations.

G. Special Construction:

1. Suitable for outdoor use.
2. High transmission loss casings where scheduled on plans.

H. Connection Sizes: Match connecting ductwork unless otherwise indicated.

I. Principal Sound-Absorbing Mechanism:

1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
2. Dissipative type with fill material.

a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 5 percent compression, Moisture-proof nonfibrous material.
b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.

3. Lining: Glass Fiber Insulation.

J. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.

1. Joints: Continuously welded or flanged connections.
2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
3. Reinforcement: Cross or trapeze angles for rigid suspension.

K. Accessories:

1. Factory-installed end caps to prevent contamination during shipping.

L. Source Quality Control: Test according to ASTM E 477.

1. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm (10-m/s) face velocity.
2. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg (1500-Pa) static pressure, whichever is greater.

M. Capacities and Characteristics:

1. Refer to Duct Silencer Schedule for additional information.

2.13 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

2.14 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff.
2. Ventfabrics, Inc.
3. Young Regulator Company.
4. Metropolitan Air Technology.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass or Copper or Aluminum.

D. Cable: Stainless steel.

E. Wall/Ceiling-Box Mounting: Recessed.

F. Wall/Ceiling-Box Cover-Plate: 1 inch diameter, nylon - paintable..

2.15 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch (25-by-25-mm)butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
   b. Access Doors up to [18 Inches (460 mm)] Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.

d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg (800 to 2000 Pa).
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.16 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.
4. Firemaster.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.17 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd. (542 g/sq. m).
2. Tensile Strength: 285 lbf/inch (50 N/mm) in the warp and 185 lbf/inch (32 N/mm) in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).
2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp and 340 lbf/inch (60 N/mm) in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.18 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements,provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.

B. Noninsulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire.

1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).

C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.

D. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.

2.19 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct security bars. Construct duct security bars from 0.164-inch (4.18-mm)steel sleeve, continuously welded at all joints and 1/2-inch- (13-mm-) diameter steel bars, 6 inches (150 mm) o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch (63-by-63-by-6-mm) steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch (300-by-300-mm) hinged access panel with cam lock in duct in each side of sleeve.

I. Connect ducts to duct silencers rigidly.

J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot (15-m) spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

K. Install access doors with swing against duct static pressure.

L. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

M. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

N. Install flexible connectors to connect ducts to equipment.

O. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect terminal units to supply ducts directly. Do not use flexible ducts to change directions.

Q. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

R. Connect flexible ducts to metal ducts with draw bands. Seal duct connection.

S. Install duct test holes where required for testing and balancing purposes.

T. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Centrifugal wall ventilators.
3. Ceiling-mounted ventilators.
4. In-line centrifugal fans.
5. Propeller Fans.
6. Ceiling Fans – Ceiling Mounted Circulation Fans.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. Twin City Fan.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories (see schedules for additional information):

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Pre-fabricated factory built; Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.

2.2 CENTRIFUGAL WALL VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. Twin City Fan.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories (see schedules for additional information:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
4. Wall Grille: Ring type for flush mounting.
5. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.
6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

2.3 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. Twin City Fan.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories (see schedules for additional information):

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.4 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. Twin City Fan.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories (see schedules for additional information):

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.5 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. Twin City Fan.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Fan Wheel: Replaceable, cast or extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Fan Drive:

1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

    a. Ball-Bearing Rating Life: ABMA 9, L_{10} of 100,000 hours.

8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories (see schedules for additional information):

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.
5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

2.6 CEILING FANS – CEILING MOUNTED CIRCULATION FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. BAF Company

B. Complete Unit: The fan shall be ETL certified and built pursuant to construction guidelines set forth by UL standards 507, 746C, 1004, 1917, and CSA standards 22.2 #0.4, 22.2 #0.17, 22.2 #0.113, 22.2 #0.100, 22.2 #0.156. The fan shall be designed to move an effective amount of air for cooling and destratification in commercial applications. The fan shall incorporate a direct drive system designed specifically for high volume, low speed fans to ensure silent operation. the sound levels from the fan operating at maximum speed shall not exceed 40 dBA (measured 20’ or 6.1 m below the blades and 20’ or 6.1 m horizontally from the center of the fan.)

C. Airfoils: The fan shall be equipped with ten (10) high volume, low speed airfoils of precision extruded aluminum alloy. Each airfoil shall be of the high performance TEC design. The airfoils shall be connected by means of two (2) locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with stainless steel retainers. Airfoils shall be powder coated for color application as selected by the architect.

D. Winglets: The fan shall be equipped with ten (10) TEC winglets designed to redirect outward airflow into downward airflow, thereby enhancing the efficiency and effectiveness of the fan. The winglets shall be die cast aluminum. A winglet shall be attached at the tip of each airfoil by means of a bolt. Winglets shall be powder coated for color application as selected by the architect.

E. Trim: The fan shall be equipped with trim inserts that nest between the hub and the inner edge of the foil. The trim inserts (10 each) shall provide a cleaner fit between the airfoils and the hub to help reduce drag, turbulence and noise. Trim inserts shall be “traffic black.”

F. Motor: The fan motor shall be direct drive and shall operate from any voltage ranging from 100-240 VAC, 1 phase, and 50/60 Hz, without requiring adapters or customer selection. The motor shall be manufactured with a Class F insulation and be capable of continuous operation in -40°F to 104°F (-40°C to 40°C) ambient conditions. The motor shall be capable of modulating the fan speed from 0~100% without the use of a gearbox or other mechanical means of control.

G. Hub: The fan hub shall be a single precision permanent mold casting of aluminum alloy for high strength and light weight. The hub shall be precision machined to achieve a well balanced and solid rotating assembly. The hub shall incorporate ten (10) safety pins made from aluminum that will secure the hub/airfoil assembly in case of shaft failure. The pins shall be attached to the body of the hub using bolts.

H. Mounting System: The fan mounting system shall be designed for quick and secure installation from a structural support beam. All components in the mounting system shall be of welded construction using steel no less than 3/16” (0.5cm) thick and be powder coated for appearance and resistance to corrosion. All mounting bolts shall be SAE Grade 8 or equivalent and rated with a minimum tensile strength of 150,000 psi (1,034 MPa). As an option, mounting components may be colored as specified by the architect or owner.

I. For mounting through ceiling media, a factory supplied escutcheon (or grommet) shall be provided to maintain a professional, finished installation.

J. Safety Cables: The fan shall be equipped with upper and lower safety cables. The upper safety cable shall provide an additional means of securing the fan assembly to the building structure. The lower safety cable shall provide an additional means of securing the motor unit to the mounting system. All safety cables shall be ¼” (0.6cm) diameter and fabricated out of 7 X 19 stranded galvanized steel. The loops must be secured with swaged Nicopress fittings, pre-loaded and tested to 3,000 lb·f (13,345 N).

K. Field construction of safety cables is not permitted.

L. Controller: The controller shall be incorporated into the fan assembly. The controller shall be factory programmed to minimize starting and braking torques. the controller shall be housed in an enclosure to prevent accidental contact with the enclosed equipment and to prevent entry of unwanted substances.

M. Wall Control: The fan shall be equipped with a remote wall control. The wall control shall be capable of mounting to a standard receptacle by means of mounting plate (which shall be included with the wall mounted device). The wall controller shall be equipped with a 1.8” (4.6cm) TFT-LCD screen and user interface for controlling the fan’s direction, operation and speed. Communication with the fan drive and controller shall be by a standard, commercially available CAT-5 (or higher) Ethernet cable that is field installed and provided by the installer. A 5’ (1.5m) ‘patch cable’ shall be provided to test and verify communication signals locally prior to connecting the remote connection cable.

N. The wall control shall be equipped with a simple diagnostic program to identify faults in the system. Provisions must be made for retrieving fan operation and diagnostic data (fault messages) through the remote wall device.

O. Warranty: The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges within the USA, F.O.B. Lexington, KY), pursuant to the complete terms and conditions of the BAF Non-Prorated Warranty in accordance to the following schedule:
   1. Airfoils Lifetime (Parts)
   2. Hub Lifetime (Parts)
   3. Motor 10 years (Parts)
   4. Controller 10 years (Parts)
   5. Labor 1 year

P. The fan shall be mounted to an angle iron or I-beam structure. Consult the Installation Guide for proper sizing and placement of angle iron for a span mount. A structural engineer must be consulted for installation methods outside the manufacturer's recommendation and a certification submitted prior to installation.

Q. To reduce the risk of injury to persons, the fan shall be installed so that the airfoils are at least 10' (3m) above the floor. The fan installation area must be free of obstructions such as lights, cables, sprinklers or other building structures; with the airfoils at least 2' (61cm) clear of all obstructions. The fan should not be installed where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems.

R. If the fan is hung from an extension tube that measures 4' (1.2m) or longer, it may be necessary to provide guy cables or struts to limit potential lateral movement of the fan. A stiffening strut braced against an additional beam may be required if there is a close clearance situation.

S. The design criteria for the fan mounting system shall be capable of handling 300 ft·lbs (407N·m) of torque.

2.7 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.8 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch (25 mm).

D. Install units with clearances for service and maintenance.

E. Label units.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

D. Connect wiring.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 23 37 13
DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round ceiling diffusers.
2. Rectangular and square ceiling diffusers.
3. Perforated diffusers.
4. Louver face diffusers.
5. Linear bar diffusers.
6. Linear slot diffusers.
7. Adjustable bar registers and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Round Ceiling Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. METALAIRE, Inc.
   b. Nailor Industries Inc.
   c. Price Industries.
   d. Titus.
   e. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum as per GRD schedule on drawings.
4. Finish: as per GRD schedule on drawings.
5. Pattern: see plans.

B. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Krueger.
   b. METALAIRE, Inc.

c. Nailor Industries Inc.
d. Price Industries.
e. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum as per GRD schedule on drawings.
4. Finish: as per GRD schedule on drawings.
5. Pattern: see plans.

C. Perforated Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Krueger.
b. METALAIRE, Inc.
c. Nailor Industries Inc.
d. Price Industries.
e. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel backpan and pattern controllers, with steel or aluminum face as per GRD schedule on drawings.
4. Finish: as per GRD schedule on drawings.
5. Face Size: as per GRD schedule on drawings.

D. Louver Face Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. METALAIRE, Inc.
b. Nailor Industries Inc.
c. Price Industries.
d. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum.
4. Finish: as per GRD schedule on drawings.
5. Face Size: as per GRD schedule on drawings.
6. Mounting: as per GRD schedule on drawings.
7. Pattern: as per GRD schedule on drawings.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Krueger.
b. METALAIRE, Inc.
c. Nailor Industries Inc.
d. Price Industries.
e. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum or Stainless steel as per GRD schedule on drawings.
4. Finish: as per GRD schedule on drawings.

B. Linear Slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Krueger.
   b. METALAIRE, Inc.
   c. Nailor Industries Inc.
   d. Price Industries.
   e. Titus.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material - Shell: Steel or Aluminum; fully insulated (front, back, end caps) as per GRD schedule on drawings.
4. Material - Pattern Controller and Tees: Aluminum.
5. Finish - Face and Shell: as per GRD schedule on drawings.
6. Finish - Pattern Controller: as per GRD schedule on drawings.
7. Finish - Tees: as per GRD schedule on drawings.
8. Slot Width: as per GRD schedule on drawings.
9. Number of Slots: One Two Three Four Insert number.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Krueger.
   b. METALAIRE, Inc.
   c. Nailor Industries Inc.
   d. Price Industries.
   e. Titus.

2. Material: Steel or Aluminum or Stainless steel as per GRD schedule on drawings.
3. Finish: as per GRD schedule on drawings.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels,

locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 81 26
DUCTLESS SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for all ductless split-system air conditioning units for this project. Included are the following topics:

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 09 23 – Direct Digital Control System for HVAC

D. Section 23 09 93 – Sequence of Operations for HVAC Controls

E. Division 26 – Electrical

1.3 REFERENCE

A. Applicable provisions of Division 01 govern work under this Section.

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.5 DESIGN CRITERIA

A. Units shall be certified in accordance with ARI Standard 210.

B. Units and all accessory remote electric powered components shall contain a unit mounted, factory prewired, electrical disconnect switch. Electrical components shall be U.L. tested and labeled. The units (except for power and/or control wiring to remote condensing units, thermostats and other specialty control interlocking as required) shall be factory prewired within the unit cabinet and shall meet all national, state and local codes. Wiring shall be numbered and connected to numbered wiring terminals.

C. The entire ductless split air conditioning system shall be furnished and installed complete with all components and accessories as required. Verify field requirements with the Manufacturer.

1.6 SUBMITTALS

A. Submit for all equipment specified under this section. Include data concerning sizes, dimensions, weights, heating capacities, materials of construction, ratings, electrical data, wiring diagrams, refrigerant piping diagrams, controls, options and manufacturers installation requirements, instructions and recommendations.

B. The Manufacturer's shop drawing submittal shall include component descriptive literature, detailed electrical wiring, water piping, glycol piping or refrigerant piping diagrams and drawings that have been specifically prepared for this project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carrier Corp.

2.2 GENERAL

A. Indoor, direct expansion, wall mounted fan coil w/ remote air cooled condensing unit.

2.3 UNIT CABINET

A. Cabinet discharge and inlet grilles shall be high impact polystyrene. Cabinet to be fully insulated for improved thermal and acoustical performance.

2.4 FANS AND MOTORS

A. Tangential direct drive blower statically and dynamically balanced as a complete unit; drip proof fan motor with 3-speed control.

2.5 REFRIGERATION SYSTEM

A. Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines, accumulator, pressure relief. System shall contain a full charge of refrigerant and oil.

2.6 UNIT ELECTRICAL AND CONTROLS

A. Unit shall be complete with all motor starters, relays, and temperature. The controls shall be microprocessor based and shall monitor the entire unit operation and alarm the following conditions:

1. High temperature
2. Low temperature
3. High humidity
4. Low humidity
5. Dirty filters
6. Loss of air flow

B. Units shall have electrical characteristics as indicated on the equipment schedule, and shall allow either aluminum or copper main conductors to be connected to terminal block power connections.

C. Provide Web interface to send E-Mail alerts to Mike Jones of Sedgwick County Facilities and Mike Elpers of Sedgwick County IT with operational alarms. Provide data jack for each ductless split location with conduit/cable to nearest IT closet for link to Sedgwick County LAN.

2.7 UNIT FILTER SECTION

A. Standard filter section shall consist of low velocity, disposable media type filters located within the unit casing and accessible from either end of unit. Unit filters shall be rated not less than 30% efficiency based on ASHRAE standard 52-76. Filter face velocity shall not exceed 300 FPM at nominal airflows. Provide one extra set of air filters.

2.8 AIR COOLED SYSTEMS

A. Air cooled remote condenser with separate condensers for each compressor circuit for dual compressor/circuit units, copper tubes, aluminum fins, factory prewired control package for condenser fan speed control to provide continuous cooling capability down to 0℉ ambient outside temperature.

2.9 FIRE STAT AND SMOKE DETECTOR

A. Located in the return air compartment to immediately shut down the air handling system and activate an aural and visual alarm when either is activated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide a weatherproof fusible electrical disconnect switch with fuses to disconnect all electrical power to outside units.

B. The entire unit and all components shall be installed and operated in strict accordance with the Manufacturer's instructions.

C. Mount the indoor and outdoor units level.

D. Fan speeds shall be adjusted by the Contractor at the job site as required to provide the design air volumes.

3.2 START-UP

A. The unit manufacturer shall provide the services of a factory trained serviceman to supervise the installation and initial startup and adjustment. Four copies of a written service report shall be submitted to the Engineer following the initial startup. It shall be signed by the serviceman responsible for performing the startup and adjustment work. It shall state all work done, indicate all readings taken and shall certify that the unit has been placed in proper running condition as recommended by the unit manufacturer and within the intent of the Contract Documents.

END OF SECTION

SECTION 26 05 00
GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern Work under this Section.

1.2 WORK INCLUDED IN THE ELECTRICAL CONTRACT

A. The mention of an Article, operation or method requires that the Contractor shall provide same and perform each operation in accordance with the conditions stated. The Contractor shall provide material, labor, equipment and transportation to complete the project in compliance with the Contract Documents.

B. Work shall be installed in accordance with State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.

C. Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become informed as to the extent and character of the work required and its relation to other work in the building.

D. The Contractor, in conjunction with the Architect's representative, shall establish exact locations of materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

E. Materials shall be suitably stored and protected prior to installation and work shall be protected after installation, during construction and prior to acceptance.

F. The Contractor shall furnish scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of equipment and apparatus required to be installed by the Contractor. This equipment shall be removed by the Contractor upon completion of the project.

G. Refer to General Requirement for temporary electrical service.

1.3 DEFINITIONS

A. The Owner. The individual who the Owner selects as the project representative.

B. The Architect.

C. The Engineer. Arnold & O'Sheridan, Inc., Consulting Engineers, Inc., Brookfield, Wisconsin.

D. This contractor. The Electrical Contractor, also referred to as "The Contractor".

E. Provide. Furnish, install and wire ready for service.

F. Exposed. Exposed to view in room, corridor or stairway.

G. Code. National, State and Local Electrical codes including OSHA requirements.

H. Substitution. Manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

I. Signal voltage. NEC class 1, 2, or 3 remote control, signaling, or power limited circuits.

J. Low voltage. 50 to 600 volts.

1.4 ABBREVIATIONS

A. A/E: Architect or Engineer

B. ENGR: Engineer

C. NEC: National Electrical Code

D. NEMA: National Electrical Manufacturer's Association

E. NFPA: National Fire Protection Association

F. OSHA: Occupational Safety and Health Administration

G. UL: Underwriter's Laboratories

1.5 PERMITS AND LICENSES

A. The Contractor shall prepare and submit applications and working drawings to authorities having jurisdiction over the project. Licenses and permits required shall be secured and paid for by the Contractor. This includes required submittals for the fire alarm system.

1.6 STANDARDS AND CODES

A. Work shall be installed in accordance with National, State, and Local codes, ordinances, laws, and regulations. Comply with applicable OSHA regulations.

B. Materials shall have a UL or ETL label where a UL or ETL Standard or test exist.

1.7 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of equipment and devices shall be established in the field in accordance with instructions from the Architect as established by manufacturer's installation drawings and details.

B. The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.

C. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.

1.8 DRAWINGS

A. The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Upon completion of the project, the contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:
   1. Locations of buried conduit or similar items. Include buried depth.
   2. Field changes of dimension or detail.
   3. Changes made by field order or change order.
   4. Details not on original contract drawings.
   5. Changes to circuit numbers.
   6. Junction box locations and conduit runs, with trade sizes indicated, for lighting, power, and electrical systems installed.
   7. Master-slave light fixture ballasting arrangements.

B. As Built Drawings - See General Requirements - Division 1.

C. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless conflict is resolved by an addendum.

1.9 MATERIALS AND EQUIPMENT

A. Materials and equipment required shall be new.

B. Equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions are allowed except as permitted in this specification.

C. Items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

1.10 SUBSTITUTIONS

A. Substitutions shall not be allowed. Where the Contractor wishes to use equipment or methods other then those listed by name, that equipment must be approved by the Engineer. To gain approval for equipment not listed, the Contractor shall submit the following to the Engineer for his review:
   1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state exceptions taken to the specification and the reasons for exceptions. Documentation relative to the request shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.
   2. Manufacturer's Cut Sheets: Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review. (Furnish 3 copies.)
   3. The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.
   4. The Contractor shall furnish other information or materials as requested by the Architect/ Engineer to establish equality.
   5. The Contractor shall acknowledge that they have reviewed the submission criteria for the request by stamping the submission with a review stamp or acknowledgement by an accompanying letter.
   6. Equipment and materials submitted for review without proper documentation shall be rejected without review.

B. Submittal, including samples, shall be received in the Engineer's office 10 business days prior to bidding.

C. Materials, equipment, or methods of installation other than those named, shall be in accordance with the general requirements and similar in composition, dimension, construction, capacity, finish and performance.

D. Contractors submitting equipment for approval, shall include in their bids incidental costs that may result from the use of equipment. Costs shall include, but not be limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of the product. The Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.

1.11 SHOP DRAWINGS AND EQUIPMENT BROCHURES

A. Submit to Engineer for review, the manufacturer's shop drawings and equipment brochures in quantities determined by the Architect for the following:
   1. 26 24 16 - Electrical Panelboards
   2. 26 33 53 - Three Phase Uninterruptible Power Supply UPS
   3. 28 31 00 – Multiplexed Addressable Fire alarm System

B. Shop drawings shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.

C. Data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:
   1. The name and location of the project.
   2. The name of the Contractor.
   3. The date of submittal.
   4. The date of the drawings and the date of each correction and revision.

D. Shop drawings for different systems and equipment shall, be bound separately by specification section and not bound by manufacturer. Submittals which contain different specification section systems bound together shall by returned unreviewed for resubmittal.

E. The Contractor shall examine shop drawings and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted properly fit into the construction. The Contractor shall also review previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.

F. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for deviations has been granted.

1.12 MAINTENANCE MANUALS

A. The Electrical Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, three sets of a Manual of Operation and Maintenance for each of the electrical and communications systems.

B. Each manual shall consist of a loose leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover phases of operation of the equipment and shall be illustrated with photographs, drawings, and wiring diagrams. Manuals shall accurately describe the

operation, construction and adjustable features of the system and its component parts. The manual shall include an equipment parts listing to facilitate the ordering of spare and replacement parts.

C. If it is desired to provide maintenance manuals in PDF format, the contractor shall provide a written request prior to submitting the manuals indicating which equipment manuals they propose to provide in this format.

D. Each manual shall contain two sets of final shop drawings depicting equipment as installed.

1.13 CLEANING AND PAINTING

A. Rubbish resulting from this work shall be removed and disposed of on a daily basis in manner as to be acceptable to the Architect.

B. The Contractor shall clean exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove rubbish and debris resulting from the work.

C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall repair and paint to match original finish.

D. Clean other equipment indicated in other sections of the specification for specific equipment.

1.14 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical systems does not constitute an acceptance of the work. The acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

B. After the work is completed and prior to acceptance, the Contractor shall conduct the following tests, tabulate data, date, sign and submit to the Engineer:
   1. Standard megger insulation test on each feeder.
   2. Ground resistance test.

C. Upon completion of the installation, the Contractor shall furnish certificates of approval from authorities having jurisdiction. The Contractor shall demonstrate that work is in perfect operating condition, with raceway and conduit system properly grounded, wiring free from grounds, shorts, and that the entire installation is free from physical defects.

D. In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of miscellaneous systems.

E. Perform other test as specifically stated in other sections of the specification for specific equipment.

1.15 GUARANTEE

A. See General Conditions.

1.16 IDENTIFICATION

A. Each service disconnect switchboards, transformers, switchgear, uninterruptible power supply, panels and cabinets shall be provided with 1/8" minimum thickness 5 ply lamecoid plastic nameplates indicating usage, plan designation and voltage where applicable. In Equipment and Mechanical Rooms this identification may

be on the exterior of the unit, in other areas identification shall be inside the door or cover. Nameplates shall be black with white engraved lettering. Lettering shall be ½" high minimum. Fasten nameplates with escutcheon pins.

B. Junction and pullboxes smaller than 12" X 12" shall be identified by using a permanent marker on the coverplate indicating originating panelboard and circuit(s) or system served.

C. Junction and pull boxes with dimensions 12" X 12" and larger shall be stenciled or provided with permanent labels as follows:
   1. Lighting and Power Feeders and Branch Circuits; 120, 208, 277, 480. Add "EM" for emergency circuits, ex. 120EM
   2. Fire Alarm - FA

D. Branch wiring shall be color coded per industry standards. Where wires of different systems junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

E. On 3-phase systems, each phase shall be identified at terminals using code markers.

F. On the inside of coverplates for light switches, and special purpose outlets, provide a permanent label identifying the panel and circuit number feeding the device. Adhesive plastic tape is permitted for this use.

G. On light fixtures at the wiring entrance point, provide a permanent label identifying the panel and circuit number feeding the fixture. Adhesive plastic tape is permitted for this use.

H. Refer to individual specification sections for more specific or additional identification requirements.

1.17 SPARE PARTS

A. Requirements for spare parts are outlines in individual specification sections. Spare parts shall be turned over, unopened, to the Owner as part of the maintenance manual submittal.

1.18 PREBID SURVEY

A. Before submitting his bid the Contractor shall tour the job site to review the following:
   1. The exact configuration of areas requiring demolition, temporary power, relocating, etc.
   2. Site conditions for material storage, staging areas, parking, etc.
   3. Problems with work sequence.

B. Conditions found that are not shown on the documents but that may affect the scope of the work shall be reported to the Engineer.

PART 2 - PRODUCTS

2.1 FIRESTOPPING

A. Fire stopping materials shall include, but not be limited to, mortars, sealants and caulks, putties, collars, intumescent wrap strips mastics, and firestop pillows. Materials and methods used shall be recognized by an independent testing agency and shall have flame and temperature ratings assigned by that agency.

B. Materials using solvents or those requiring hazardous waste disposal shall not be used.

C. The firestop assemblies shall meet fire test and hose stream test requirements of an independent testing agency.

D. Acceptable manufacturers:
   1. 3M Corporation.
   2. Rectorseal Corporation

2.2 SLEEVES

A. Schedule 40 galvanized steel pipe.

B. Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.

C. Refer to architectural room finish schedule and/or drawings for wall and ceiling surfaces and finishes.

D. Panel construction shall be as follows:
   1. Non-Security Areas: Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.
   2. Secure Locations: Minimum 16 gauge frame with not less than 14 gauge hinged door panel. Door locks shall be locking type. Furnish and install locking devices in accordance with types specified in Division 11. See plans for secure locations.

PART 3 - EXECUTION

3.1 FIRESTOPPING

A. Openings in fire rated construction and annular spaces around conduits, cable trays, and other penetrating items shall be protected in accordance with NEC article 300-21 and in accordance with the Wisconsin Administrative Code, Department of Commerce Chapter 51.049. The fire rating of the protective seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the construction is maintained.

B. Wall or floor penetrations openings shall be as small as possible.

C. Openings and annular spaces required by code to be protected, shall be protected whether specifically indicated on the plans or not.

D. Installation of materials and assemblies shall be in strict accordance with the manufacturer's instructions.

3.2 SLEEVES

A. Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It

shall be the Electrical Contractor's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

B. Floor sleeves shall extend a minimum of 2 inches above the finished floor.

3.3 ELECTRICAL WORK

A. Work shall be performed on de-energized equipment whenever possible. Due to the proximity of energized cables in the existing manholes and other equipment in the work area, some work may be required to be performed on or near energized equipment. This work requires that appropriate personal protective equipment (ppe) is used for personal safety. Before working on or near energized electrical equipment, an "energized electrical work permit" must be filled out and signed by all workers at the job site. This form shall ensure that the hazards of working on or near exposed live parts receive adequate consideration. This work must be discussed with the owner's designated electrical safety person. The form must be signed by all workers prior to any work being performed on the job site.

END OF SECTION

SECTION 26 05 02
ELECTRICAL DEMOLITION AND ALTERATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this Section.

1.2 JOB CONDITIONS

A. The existing buildings shall remain in service during construction. Power outages and interruptions in building systems shall be held to a minimum and shall be done at a time convenient to the Owner. The time of outages shall be scheduled with the Owner and other trades affected by the outage at least ten working days in advance. Demolition work shall be scheduled at periods and times acceptable to the Owner.

B. Prior to demolition or alteration of structures, the following shall be accomplished:
   1. Owner release of structure.
   2. Disconnection of electrical power to equipment and circuits removed or affected by demolition work.
   3. Electrical services rerouted or shut off outside area of demolition.
   4. Coordinate sequencing with Owner and other Contractors.
   5. Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.

C. Contractor shall dispose of obsolete material.

D. Contractor shall notify the Engineer of existing code violations observed during the course of performing his work. If corrective action needs to be taken that changes the scope of the work, a change order will be processed accordingly.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 MODIFICATIONS

A. Feeders, branch circuits, and other system wiring which are to remain in service but which are presently routed through areas being demolished shall be rerouted around demolition area.

3.2 REMOVAL

A. Remove or relocate conduit, wire, boxes, fixtures, and electrical equipment that are in the way of construction.

B. Reconnect circuits and equipment to be continued in service.

C. Provide temporary wiring to equipment that is to remain in operation during demolition and whose power will be interrupted as a result of demolition.

D. Remove electrical equipment released from service as a result of construction.

E. Do not reuse removed electrical equipment except as specifically shown on the drawings.

F. Where the plans require existing equipment to be removed or relocated, removal shall include equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors. In instances where a device is removed but active conductors remain in the backbox and the box is mounted in a wall which is remaining, the backbox may remain and a blank coverplate provided. If removal of the box is specifically indicated on the plans the active conductors shall be intercepted at convenient, accessible locations and rerouted to allow existing box to be removed. When boxes are removed from existing walls which remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand flush with adjacent surfaces. The General Contractor shall be responsible for finish work unless specifically indicated otherwise on the plans.

3.3 DISPOSAL

A. Dispose of equipment that is removed unless specifically indicated on the drawings.

B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

C. The Contractor shall tour demolition areas with the Owner to determine the status of other equipment to be removed during demolition. Equipment that is to be salvaged for reuse shall be removed by the Contractor and transported to a designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

D. Contractor, at his option, may install new conductors in existing raceways provided that the raceways are in place and are properly sized and supported. Existing conduits that are removed from their existing location shall not be reinstalled.

3.4 ASBESTOS REMOVAL

A. Work involved with asbestos removal, disposal or abatement shall not be considered as part of this project. Work in this regard shall be the responsibility of the Owner. If this Contractor shall discover the presence of asbestos material he shall cease work immediately and notify Owner and Engineer of condition.

3.5 ALTERATIONS

A. The Contractor shall be responsible for work of other trades to facilitate installation of electrical work in the existing building.

B. Work required by Electrical Contractor which is normally performed by other trades shall be done under direction and at the expense of Electrical Contractor.

END OF SECTION

SECTION 26 05 19
LOW VOLTAGE WIRES, CABLES AND CONNECTORS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Application requirements of Division 00 and Division 01 shall govern work under this Section.

1.2 SCOPE

A. Provide wires, cables and connectors as specified herein.

B. Provide branch wiring and feeder systems to serve lighting, receptacles, motors, and other equipment loads.

C. The terms “feeders” and “branch circuits” as used in this section are as defined in NEC Article 100.

1.3 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 27 26 - Wiring Devices

C. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. Reference Standards of the following associations:
   1. National Electrical Contractor's Association (NECA) - Standard of Installation
   2. Insulated Cable Engineers Association (ICEA)

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Copper conductor only.

B. Conductor insulation shall be rated 600 volts minimum. Insulation color for low voltage (secondary feeders and branch circuits) conductors shall vary to depict the type of conductor. Colors shall be as indicated elsewhere in this section and as required by code.

C. Single conductor #10 AWG size and smaller for general use wiring may be stranded or solid conductors at the contractor’s option, provided with type THWN insulation. Minimum size shall be #12 AWG on 208 volt systems and #14 AWG for 480 volt systems. Conductors with dual rated insulations are approved provided one of the ratings is THWN.

D. Single conductor #8 AWG and larger for general use wiring shall be stranded configuration with type THWN insulation. Conductors with triple rated insulations are approved provided the ratings include one of the ratings that are listed.

E. Conductors installed in wet locations and areas with high humidity shall be type XHHW-2 or USE. Wet locations shall include, but not be limited to, conduits installed in contact with the earth and underground electrical ductbanks.

F. Conductors shall not be installed at temperatures below the manufacturer's minimum installation temperature.

G. Unless specifically indicated otherwise, conductor sizes indicated on the plans are based on the ampacities listed for conductors rated at 75 degrees C.

H. All conductors, whether stranded or solid, shall be terminated using approved methods.

2.2 COMMUNICATIONS CABLES

A. Communications cables shall be the type as called for in the specifications and drawings for the installation of various communications systems.

B. Communications cables installed in cable trays shall be rated for use in cable tray and shall be of fire resistive construction.

C. Cables routed exposed through return air ceiling plenums shall be smoke resistance teflon coated cable classified as type CLP or CMP communications cable.

2.3 JOINTS, TAPS AND SPLICES

A. CONDUCTORS NO. 10 AWG AND SMALLER
   1. 3M Scotch-lok compression type solderless connectors with plastic cover.

B. JOINTS, TAPS, AND SPLICES IN CONDUCTORS NO 8 AWG AND LARGER
   1. Solderless compression type connectors, tool and die applied, of a type that will not loosen under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.

2.4 TAGS AND LABELS

A. BRANCH CONDUCTOR LABELS
   1. Sleeve type wrap around adhesive markers with factory printed circuit numbers.

B. FEEDER CONDUCTOR LABELS
   1. Metal tags or flame-resistant adhesive label tags at the Contractor's option. Label shall include conductor source, voltage, and load/equipment served.

2.5 RUBBER INSULATING ELECTRICAL TAPE

A. Scotch 3M model 23, 30 mil tape.

B. Plymouth #2117, 30 mil tape.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

B. Run wire and cable in conduit, unless otherwise indicated on drawings.

C. Do not draw conductors into conduits until building is enclosed and watertight and until work that may cause conductor damage has been completed.

D. Voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of NEC Article 215.

E. Examine areas and conditions under which conductors are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

F. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 JOINTS, TAPS AND SPLICES

A. Each tap, joint, or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and a finish wrap of color coding tape, where required by code.

B. Cable splices shall be made only in distribution and junction boxes.

3.3 WIRE AND CABLE IDENTIFICATION

A. TAGS AND LABELS
   1. Install tags and or/labels on conductors and cables in junction boxes, pullboxes, wireways, wiring gutters of panels, and other accessible locations. Labels and tags shall contain information under “products” for branch circuit conductors and feeder conductors. Use architectural numbers on wire tags, and Owner numbers on touch screen door/room icons.
   2. Conductor phase identification. Different conductor insulation colors and electrical tape colors shall be used to identify the different phases of conductors in a given circuit and to identify the neutral and ground conductors. Painted identification is not acceptable. Provide color identification on conductors at accessible locations. Requirements of the Code regarding conductor identification shall always be followed where applicable. In general, colors shall be as follows:
      a. 120/208 Volt Systems Neutral Conductor - Solid White: Provide additional markings for neutral conductors in the same raceway.
      b. 120/208 Volt Systems A-Phase, B-Phase, And C-Phase Unswitched Legs: Solid black, solid red, and solid blue respectively. Different colors shall be used to identify switched legs.
      c. 480/277 Volt Systems Neutral Conductor - Solid Gray: Provide additional markings for neutral conductors in the same raceway.
      d. 480/277 Volt Systems A-Phase, B-Phase, And C-Phase Unswitched Legs: Solid brown, solid orange, and solid yellow respectively. Different colors shall be used to identify switched legs.
      e. Ground Conductors - Solid Green: Provide additional markings for ground conductors in the same raceway.
   3. For additions to existing buildings, existing conductor color-coding schemes shall be followed unless in conflict with the codes. If no logical color-coding scheme exists, color-coding indicated above shall be followed.

3.4 FIXTURE WIRES

A. Use conductor with insulation rated for current, voltage, and temperature to which conductor is subjected. Conductors used as fixture wires shall be

insulated with materials of the type recognized by the National Electrical Code, Article 402.

B. Minimum wire size shall be selected as defined in NEC Article 240 for the branch circuit overcurrrent device ampacity and conductor length involved.

3.5 FEEDER INSTALLATION

A. Install in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.

B. Extend feeders at full capacity from origin to termination.

C. Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular- mil area, insulation type, and terminated in same manner.

D. Where parallel feeder conductors are run in separate raceways, each raceway shall have same physical characteristics.

E. Feeder conductors in switchboards, panelboards, pullboxes, gutters, and other open wiring spaces shall be bundled by feeder using plastic tie wraps at intervals not greater than 3’ on center.

3.6 BRANCH CIRCUIT CONDUCTORS

A. Install branch circuits and switched circuits to comply with the circuiting, switching, and functions shown on the drawings.

B. Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.

C. Size 120V branch circuits for length of run on following basis:
   1. 0 to 75 ft run from panelboard to first outlet: No. 12 AWG minimum.
   2. 75 to 125 ft run: increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.
   3. 126 to 200 ft run: increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.
   4. 201 and above: wiring to be sized for 3% maximum voltage drop.

D. Route branch circuits and switch legs as dictated by construction, these specifications, or instruction from Engineer.

E. Size conduit, outlet boxes, and other raceway system components in accordance with NEC requirements as minimum.

F. Circuit numbers as shown on drawings are for Contractor to plan his wiring and for estimating purposes and are not necessarily the exact circuit numbers to be used in that panel for that particular load. Exact circuit numbers for each load are to be selected by the Contractor at his option. Balanced load on panelboard bus is to be determining factor in arrangement of circuits. Panelboards average load shall not differ from phase to phase by ± 7½%.

END OF SECTION

SECTION 26 05 26
GROUNDING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this Section.

1.2 SCOPE

A. Provide material, labor and incidentals necessary for the installation of a code compliant grounding system.

1.3 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

1.4 APPLICABLE CODES

A. National Fire Protection Association (NFPA), NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.

B. Local Codes and Ordinances.

1.5 REFERENCE STANDARDS

A. Conform to the standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PRODUCTS

2.1 GROUND WIRES

A. Copper only.

B. Size as shown on drawings, or required by NEC.

C. No. 6 AWG minimum.

PART 3 - EXECUTION

3.1 GENERAL

A. Ground electrical systems and equipment required by code, utility, local ordinances, and to requirements herein.

B. Install separate code rated grounding conductors to special equipment and activity areas required by code.

C. Cable connections and joints shall be non-reversible compression connected or thermo-welded.

3.2 EQUIPMENT GROUND

A. Bond metallic conduits, supports, cabinets, and other equipment to provide an electrically continuous equipment ground from service to outlet boxes.

B. Ground wire shall be bonded at equipment and at first junction box of conduit system on line side of conduit to the system.

C. Install grounding conductors to permit shortest path from equipment to ground. When grounding conductor runs through metallic conduit, bond to conduit at entrance and exit with a bolted clamp.

D. Install a green equipment grounding conductor in all conduits serving receptacles and special purpose outlets.

E. Connections shall be accessible for inspection and checking. No insulation shall be installed over ground connections.

F. Ground connection surfaces shall be cleaned and connections shall be made so that it is impossible to move them.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide equipment for the support of electrical equipment as detailed or indicated on the drawings and as specified herein.

1.3 APPLICABLE STANDARDS AND CODES

A. National Electrical Contractors Association (NECA), Standard of Installation.

B. National Electrical Manufacturers Association (NEMA).

C. American National Standards Institute (ANSI).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kindorf.

B. Midland-Ross Corp.

C. Elcen Co.

D. Steel City/Midland-Ross Corp.

E. Unistrut.

F. B-Line.

G. Power-Srut.

2.2 GENERAL

A. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

2.3 CONDUIT SUPPORTS

A. Continuous slot or T-slot galvanized steel concrete insert channel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install hangers, supports, and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.

B. Installation methods shall be in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of expansion anchor and an edge of exterior corner of concrete shall be not less than 4½ times the diameter of the hole in which it is installed.

3.3 SUPPORT OF CONDUIT

A. Fasten conduit to structural parts of building in a manner acceptable to Engineer.

B. Do not use perforated hanger iron.

C. See section 26 05 29.

D. Support conduit as follows:
   1. Single Conduit Runs:
      a. Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for exposed conduit and conduit on exterior walls.
   2. Single Conduit Runs in security locations:
      a. Vertical surfaces: Galvanized, Heavy duty, 2 hole steel pipe straps with Torx head, center pin type fasteners.
      b. Horizontal Surfaces: Galvanized, heavy duty, 2 hole steel pipe straps.
      c. Horizontal Surfaces in security location: Galvanized, heavy duty, 2 hole steel pipe strips.
   3. Multiple Conduit Runs:
      a. Vertical Surfaces: Horizontal or vertical rack channel with conduit straps.
      b. Horizontal Surfaces: Single or double rack channel trapeze, with conduit straps and supported with threaded hanger rods.
   4. Conduits Passing Between Floors and Through Roof:
      a. 1¼" and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.
      b. Conduit extending through roof shall pass through a ceiling box at roof lines.
      c. Provide 14-gauge minimum copper box with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
      d. Conduit and pitch pocket shall be installed in advance of roofing work.

3.4 VERTICAL CABLE SUPPORT

A. Conductors in vertical raceways shall be supported using cable supports. Locate supports so that each 25' length of conductor in a vertical raceway is supported.

END OF SECTION

SECTION 26 05 33
CONDUITS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Drawings and General Provisions of Contract, General and Supplementary Conditions, and Division 01 Specifications, apply to this Section

1.2 SCOPE

A. Provide conduit systems for power wiring and communications systems as specified. Flexible, modular-wiring systems shall not be used.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. National Electrical Contractor's Association (NECA) Standard of Installation.

B. National Electrical Code (NEC) including local supplements.

PART 2 - PRODUCTS

2.1 CONDUIT FITTINGS - GENERAL

A. Fittings for metal raceways shall be steel, and shall be zinc galvanized or cadmium plated.

B. Fittings for PVC raceways shall be of the type recommended by the raceway manufacturer.

C. Do not use aluminum or die cast fittings.

D. Do not use malleable iron.

E. Do not use running threads.

F. Do not use indentor type fittings.

G. Box connector bushings shall have insulated throats. Integral grounding lugs shall be provided where required by code or detailed on the drawings and elsewhere in the specifications.

H. Termination bushings for conduits that terminate in free air, as at cable trays, communications backboards, in electrical vaults, and in electrical manholes.

I. For conduits carrying conductors rated 50 volts and below and where no ground connection is required. Termination bushings may be push-on, non-metallic, insulating type as manufactured by Arlington Industries, Inc. Equivalent products by other manufacturers are acceptable.

J. For conduits carrying conductors rated 50 volts and below where a ground connection is required provide termination bushings with insulated throats and integral grounding lugs.

K. For conduits carrying conductors rated 51 volts and above. Termination bushings shall have insulated throats. Integral grounding lug shall be provided where required by code or required on the drawings and elsewhere in the specifications.

2.2 GALVANIZED RIGID CONDUIT (GRC) AND INTERMEDIATE METAL CONDUIT (IMC)

A. Manufactured lengths, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings:
   1. Threaded
   2. Liquid tight

2.3 ELECTRICAL METALLIC TUBING (EMT)

A. Standard lengths and size

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings: Set screw type.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Heavy wall, sunlight resistant, PVC jacket

D. Minimum size ½ inch.

E. Connectors and couplings
   1. Liquid tight
   2. Grounding type
   3. Suitable for wet locations
   4. Tapered threaded hub.
   5. Non-metallic materials

2.5 FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Connectors and couplings.
   1. Threaded.
   2. Grounding type.
   3. Insulated throat.
   4. Two screw clamp type with locknuts.
   5. Externally Secured.

2.6 SECURE METAL RACEWAYS

A. Two piece metal construction.

B. Baked enamel paint finish.

C. Holocom SDS-WM-RCW-ST series Secure Raceway minimum.

2.7 EXPANSION FITTINGS

A. Copper bonding jumper, Crouse-Hinds Type XJ.

2.8 EXPANSION/DEFLECTION FITTINGS

A. Copper bonding jumper, Crouse-Hinds Type XD.

2.9 CONDUIT BODIES

A. Galvanized or cadmium plated.

B. Threaded hubs.

C. Removable cover, with gasket.

D. Corrosion-resistant screws.

PART 3 - EXECUTION

3.1 GENERAL

A. Requirements:
1. Seal conduits that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.
2. Install conduit expansion fittings with bonding jumper in following locations:
   a. Conduit runs which cross structural expansion joints
   b. Conduit runs where movement perpendicular to axis of conduit may be encountered.
3. Locate junction boxes, conduit bodies, and other access covers so as to be accessible to electrical wiring.
4. Cut joints shall be square, reamed smooth, and drawn up tight.
5. Keep conduit plugged, clean, and dry during construction. Before wire pulling begins, pull cleaning plug through conduits to clear of dirt, oil, moisture, and other debris.
6. Install #12 AWG pull wire in empty conduit.
7. Cap spare conduits.
8. Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal.
9. Route all conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members.
10. Make bends and offsets without kinking or destroying smooth bore of conduit. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.
11. Conduit runs that extend through areas of different temperature or atmospheric conditions shall be sealed, drained, and installed in a manner that prevents will prevent drainage of condensed or entrapped moisture into cabinets, and equipment enclosures.

12. Conduits shall be routed at least 12” from parallel to steam lines, hot water pipes, flues, or high temperature piping or ducts shall not be closer than 12 inches from such and shall not be closer than 12 inches clear when crossing same.
13. Conduit shall not be routed over boiler, incinerator, or other high temperature equipment.
14. Where conduits must cross or follow the same path as water, steam or other fluid piping, electrical conduits shall be installed above, not below, such piping.
15. Install bushings with ground lugs and integral plastic linings at equipment with open-bottom conduit entrances.

3.2 CONDUIT LOCATION REQUIREMENTS

A. Interior conduits for wiring systems rated 50 to 600 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
   1. Flexible conduit where required by other paragraphs in this section.
   2. Unless otherwise restricted by codes.
   3. Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.
   4. Conduits in corrosive locations shall be PVC coated GRC. See floor plans for corrosive locations.
   5. Conduits in security locations shall be IMC or GRC. See floor plans for security locations.
   6. Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

B. Interior conduits for wiring systems rated 0 to 50 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
   1. Flexible conduit where required by other paragraphs of this section.
   2. Unless otherwise restricted by codes.
   3. Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.
   4. Conduits in security locations shall be IMC or GRC. See floor plans for security locations.
   5. Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

3.3 FLEXIBLE CONDUITS

A. Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit and prevent entrance of moisture.

3.4 CONCEALMENT

A. Unless specifically noted otherwise, conduits shall be routed concealed in finished spaces and shall not be visible at any point within the finished space or from the building's exterior. This requirement also applies to new conduits installed in existing construction.

B. Exposed raceway may be used on remodeling projects only where physically impossible to route concealed in existing construction. In such cases where exposed conduit is allowed it shall be equivalent to Holocom SDS-WM-RCW-ST series Secure Raceway or GRC conduit installed in accordance with detail 5/SE8.0 and sized as dictated by the wiring quantities. In each case the specific

raceway type and routing shall be submitted to the Architect/Engineer for approval. Where allowed, the general installation requirements are as follows:

1. Raceways shall be routed horizontally along the corners of walls and ceilings, above edges of base molding at floors, or along the tops of window and door frames.
2. Raceways shall be routed vertically along corners of adjacent walls and along the edges of window and door frames.
3. Raceways shall not be routed down or across open wall surfaces except in portions of runs not exceeding 12 inches in length.
4. Raceways shall be painted to match wall finishes. EC is responsible for painting of raceways.
5. Fittings and boxes used with raceways shall be specifically designed and approved for use with the raceways.

C. Conduits may be routed exposed in mechanical equipment rooms and utility rooms.

3.5 SUPPORTS

A. Raceways installed concealed in the stud space of hollow, stud and drywall partitions shall be fastened to steel studs with spring steel clips. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions. Conduit supports utilizing tie wires shall not be used.

B. Interior surface mounted conduits attached to walls:

1. Raceways sizes 1 ¼" diameter and smaller: One hole support straps.
2. Raceways sizes 1 ½" diameter and larger: Two hole straps.
3. Light gauge steel framing fastened to wall surface with conduits fastened to steel framing using two piece conduit clamps.

C. Interior surface mounted conduits attached to underside of structural ceilings and roofs:

1. Two hole support straps.
2. Light gauge steel framing fastened to ceiling surface with conduits fastened to steel framing using two piece conduit clamps.
3. Where underside of roof structure consists of steel trusses, joists, beams, etc., spring steel clips for supporting raceways will be allowed. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions.

D. Interior conduit runs suspended from the underside of structural ceilings and roofs:.

1. Single Conduit Runs: Threaded rod fastened to structure with conduit attached to rod utilizing steel, yoke type support.
2. Multiple Conduit Runs: Horizontal light gauge steel framing suspended from structure with threaded rods, minimum two per frame, in a trapeze configuration. Conduits fastened to steel framing using two piece conduit clamps.

E. Provide riser clamps around all conduits 1-1/4 inch or larger that are routed between floors.

F. Conduits shall not be supported by, or attached to the suspension systems for dropped ceiling systems unless specifically detailed on the drawings.

G. Secure conduits in place with malleable corrosion-proof alloy straps or hangers.

H. The use of perforated strapping as a conduit hanging method is not acceptable.

I. The use of tie wires to support conduits is not acceptable.

3.6 FIRESTOPPING

A. Provide fire stopping at conduit penetrations through fire rated construction in accordance with section 26 05 00.

3.7 CUTTING AND PATCHING

A. Provisions for openings, holes, and clearances through walls, floors, ceilings, and partitions shall be made in advance of construction.

B. Provide cutting, patching and painting necessary for the installation of electrical systems.

C. Where conduits need to penetrate concrete or masonry construction install 22 gauge galvanized steel pipe sleeves, 1 inch larger in diameter than the conduit being installed. Sleeves shall extend 2 inches above the floor slab or wall penetrated. Install sleeves before walls or slabs are poured or constructed.

D. Provide drawings indicating size and location of anticipated floor sleeves for the installation of electrical conduits.

3.8 ADJUSTMENT AND CLEANING

A. Restore damaged areas on PVC jacketed, rigid conduit with spray type touch-up coating compound or as recommended by manufacturer.

3.9 CONDUIT SYSTEMS

A. Where raceway systems are required, separate raceway systems shall be provided for each wiring system as follows:
   1. 208 volt normal power wiring systems.
   2. 208 volt code required emergency power wiring systems.
   3. 208 volt optional emergency power wiring systems.
   4. 480 volt normal power wiring systems.
   5. 480 volt code required emergency power wiring systems.
   6. Fire alarm systems.
   7. Video surveillance systems.
   8. Electronic Card Key Access System
   9. Voice/data communications raceway systems.
   10. Wiring for security system processing equipment.
   11. Wiring for security system control panels.
   12. Wiring for door control and door monitoring systems.
   13. Wiring for security voice communication system.
   14. Wiring for security type facility wide paging systems.
   15. Wiring for card access systems.

END OF SECTION

SECTION 26 05 33.1
ELECTRICAL BOXES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide electrical boxes in accordance with this specification.

1.3 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

C. Section 26 27 26 - Wiring Devices

D. Section 26 05 29 - Supporting Devices

E. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. Reference Standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PRODUCTS

2.1 INTERIOR WALL OUTLET BOXES - FLUSH MOUNTED

A. Stamped steel, four inch square, 2-1/8" deep minimum, with square corners. Provide with raised device rings, height to match wall finish thickness. Mounting accessories. Larger width boxes shall be provided for ganging requirements indicated on plans.

2.2 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DRY LOCATION

A. Stamped steel, four-inch square, 2-1/8" deep, with round corners. Provide rounded corner raised box covers with openings for devices being installed. Refer to section 16111 for restrictions on exposed conduit systems.

2.3 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DAMP OR WET LOCATION

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to section 26 05 33 for restrictions on exposed conduit systems.

2.4 INTERIOR WALL OUTLET BOXES – SURFACE MOUNTED – SECURITY LOCATIONS

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to section 26 05 33 for restrictions on exposed conduit systems.

2.5 EXTERIOR WALL OUTLET BOXES - SURFACE MOUNTED

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to section 26 05 33 for restrictions on exposed conduit systems.

2.6 ELECTRICAL BOXES IN CORROSIVE LOCATIONS

A. PVC coated cast steel boxes compatible with conduit system installed. Coating shall cover both interior and exterior surfaces. See floor plans for identification of corrosive areas.

2.7 SPECIAL BOXES

A. Provide special boxes fabricated by the manufacturer of fixtures and other devices where standard outlets are not applicable.

2.8 GENERAL PURPOSE JUNCTION AND PULL BOXES

A. Fabricate from code gauge galvanized steel, with covers held in place by corrosion resistant machine screws.

B. Size shall conform to code requirements for number of conduits and conductors entering and leaving box.

C. Provide with welded seams, where applicable, and equip with corrosion-resistant nuts, bolts, screws, and washers.

2.9 ACCESS PANELS

A. Furnish type necessary for the particular wall or ceiling construction in which they occur.

B. Panels shall contain screwdriver cam locking device.

2.10 WEATHERPROOF JUNCTION AND PULL BOXES

A. Stainless steel or cadmium plated malleable iron cast type with threaded hubs, cast cover, and neoprene gasket.

2.11 BETWEEN STUD BOX SUPPORT BRACKETS

A. Stamped and fabricated steel bracket designed to support 4" or 4-11/16" electrical boxes between wall studs.

B. Manufactured by Erico, RBS series or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices.

B. Seal conduit at entrance to weatherproof boxes for interior and exterior locations exposed to weather or moisture.

C. Install knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes to provide access to electrical wiring. Relocate boxes rendered inaccessible by the installation of work by other trades.

E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers.

G. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum 12 inches.

H. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

I. Do not burn conduit holes, use knock-out punches, or hole saws.

J. Use "no-bolt" studs where required.

K. Use handy boxes only where specifically detailed on the drawings.

L. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings within the box. Do not use box extensions to create additional volume to meet NEC requirements for the number of conductors contained in a box.

3.2 EXPOSED OUTLET AND JUNCTION BOXES

A. Install weatherproof outlet and junction boxes outdoors and in areas where drawings show weatherproof (WP) wiring devices.

3.3 INTERIOR OUTLET BOX ACCESSORIES

A. Provide outlet box accessories for each installation, including but not limited to: mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes being used and meeting requirements of individual wiring situations.

3.4 OUTLET BOX LOCATIONS

A. Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to a minimum.

B. Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified and shall be determined by:
   1. Construction or code requirements.
   2. Conflict with equipment of other trades.
   3. Equipment manufacturer's drawings.

C. Where receptacles and communications outlets are shown grouped next to each other on the drawings, the boxes for these outlets shall be mounted next to each other and shall not be located according to stud spacings. The Contractor shall utilize between stud box supports to assist in mounting boxes proximal to one another on a consistent spacing between wall studs.

D. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in.

E. Mounting heights for devices and equipment to be measured from finished floor to centerline of device.

END OF SECTION

SECTION 26 24 16
ELECTRICAL PANELBOARDS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this Section.

1.2 SCOPE

A. Provide panelboards as shown on the drawings and as specified herein.

1.3 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

C. Plans - Panel Schedule

1.4 SUBMITTALS

A. Shop drawings.
   1. Cabinet dimensions, nameplate nomenclature, electrical ratings, and breaker type listing.
   2. Product data sheets with installation instructions.
   3. Operating and Maintenance manuals.
   4. Field quality control test results.
   5. Operating and maintenance data.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not store panelboards exposed to weather.

B. Protect panelboards against damage from work of other trades.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Use of a manufacturer's name and model or catalog number is for the purpose of establishing standard of quality and general configuration desired:
   1. Square D, Eaton/Cutler-Hammer, General Electric, Siemens

2.2 PANELBOARD UL LISTED SHORT CIRCUIT INTEGRAL EQUIPMENT RATINGS

A. 208Y/120V panels. 10,000 RMS symmetrical amperes minimum or as shown on drawings. Equivalent to Square D type NQOD.

2.3 PANELBOARD CONSTRUCTION

A. Main breaker or main lugs only, per panelboard schedule.

2.4 BUSSING

A. Plated copper phase bussing.

B. Plated copper neutral bus with terminals.

C. Copper equipment grounding bus with terminals.

D. Distributed phase sequence type.

E. Ratings per panelboard schedule, 100-amp minimum.

2.5 PANEL CABINETS

A. Code gauge galvanized steel.

B. Minimum 20" wide.

C. Minimum 5¾" deep.

D. Height as required to accommodate breakers and spaces indicated on plans and code required gutter space.

E. Gutters adequate for wire size used, 4” minimum.

2.6 PANEL FRONTS

A. Dead front safety type.

B. Concealed adjustable trim clamps.

C. Code gauge steel with rust inhibiting primer and baked enamel finish. Cover thickness shall not be less than the requirements indicated the listing for UL 50.

D. Panel front cover shall have piano hinge to allow access to wiring gutters with out removal of panel trim. Hinged trim held in place with screw fasteners. Door shall be built into trim which allows access to breakers as well as to hinged trim screw fasteners. Breaker access door shall have the following features:
   1. Concealed piano hinge.
   2. Flush stainless steel cylinder tumbler type locks with spring loaded door pulls.
   3. Locks for all job panels keyed alike.

E. Steel frame circuit directory holder with directory cards on inside face:
   1. Clear plastic cover.
   2. Typewritten descriptions.

2.7 BRANCH BREAKER DETAILS

A. Conform to Section 26 28 00.

B. UL listed terminals for type and temperature rating of wire utilized. Anti-turn solderless type.

C. Circuit breaker construction for NQOD and NEHB panels shall bolt on to panel bussing.

2.8 NAMEPLATES

A. Engraved laminated plastic type.

B. Letters $^{3}/_{16}$" high.

C. White letters on black background.

D. Verify panelboard designation with the owner's representative.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive panelboard to assure adequate clearance for panelboard installation.

B. Monitor construction of other trades so that no material is installed over the top or in front of the switchboard in violation of code required working clearances.

C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Surface mount as specified on drawings and schedules.

C. Support panel cabinets independently to structure with no weight bearing on conduits.

D. Install panelboards so top breaker is not higher than 6 ft-0 in. above floor.

E. Adjacent panel cabinets shall be of same size and mounted in horizontal alignment.

F. Install in each panelboard a typewritten directory accurately indicating rooms and equipment being served.

G. Attach nameplates. Nameplates for panels in public areas shall be attached to the inside face of the cover. Nameplates for panels in equipment rooms and other non-public areas shall be attached to the outside face of the cover.

3.3 FIELD QUALITY CONTROL

A. Balance load among feeder conductors.

B. Unbalance shall not exceed ± 7½% of computed average load per phase.

C. Energize each circuit and check for correct function.

3.4 ADJUSTMENT AND CLEANING

A. Adjust doors and operating mechanisms for free mechanical movement.

B. Tighten lugs and bus connections.

C. Thoroughly clean enclosure inside and outside of all dust and debris before final acceptance.

D. Sand, prime and paint scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 27 28
MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide disconnect switches for the disconnection of motorized equipment and other equipment required by the national and state electrical codes and as specified herein. Code required disconnects shall be provided for all equipment unless included with equipment provided by others. Verify requirements with other trades.

1.3 RELATED WORK

A. Section 26 05 26 - Grounding

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

1.4 SHOP DRAWING SUBMITTALS

A. Enclosure dimensions, nameplate nomenclature, electrical ratings, and fuse and breaker type listing.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not store exposed to weather.

B. Protect against damage from work of other trades.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Electric, Siemens, Square D, Eaton/Cutler-Hammer.

2.2 DISCONNECT RATINGS

A. UL listed short circuit rating. 200,000 RMS amps with Class R fuses.

2.3 SAFETY SWITCH CONSTRUCTION

A. Switches for 250 volt or 600 volt equipment
   1. NEMA heavy duty Type HD.
   2. Horsepower rated or as indicated on drawings
   3. Dual cover interlock.
   4. Visible blades.
   5. Provisions for control circuit interlock.
   6. Pin type hinges.
   7. Tin plated copper current carrying parts.
   8. Quick make and break operator mechanism.
   9. Handle attached to box, not cover.

10. Handle position indication, ON in up position and OFF in down position.
11. Padlock provisions for up to three padlocks in OFF position.
12. UL listed lugs for type and size of wire specified.
13. Spring reinforced fuse clips for Type R fuses where fusible disconnect is indicated or required.
14. Provisions for insulated neutral.
15. Disconnect feeder grounding kit.

2.4 ENCLOSURES

A. Indoor. NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.

2.5 NAMEPLATES

A. Engraved laminated plastic type. Identify specific name of equipment served.

B. Letters $^{3}/_{16}$" high.

C. White letters on black background.

D. Identify per equipment controlled.

PART 3 - EXECUTION

A. Provide label on inside of disconnect cover identifying the types of fuses to be used.

3.2 GROUNDING

A. If disconnect concentric knockouts are used, the contractor shall provide a grounding bushing or other means to insure ground continuity. Concentric knockouts are not listed for grounding continuity.

3.3 INSPECTION

A. Examine area to receive disconnect for adequate clearance for installation.

B. Start work only after unsatisfactory conditions are corrected.

3.4 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Locate disconnect switches as shown on drawings or required by NEC.

C. Install on equipment support where feasible, or anchor firmly to wall or structural surface.

3.5 ADJUSTMENT

A. Adjust covers and operating mechanism for free mechanical movement.

B. Verify overcurrent protection to provide proper operation and compliance with NEC.

C. Tighten wire and cable connections.

D. Thoroughly clean enclosure inside and outside of all dust and debris before final acceptance.

E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 27 00 00
COMMUNICATIONS CABLE AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination Components and related sub-systems as part of a Structured Cabling System to support IP based video surveillance system at the Sedgwick County Juvenile Detention Center. Inter-building, Vertical (Backbone), and Horizontal (Station) cabling comprised of Copper, and Fiber Optic Cabling are covered under this document. Included are the following topics:

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 26 05 00 – General Electrical Provisions

C. Section 26 05 26 - Grounding

D. Section 26 05 29 – Supporting Devices

E. Section 26 05 33.1 – Electrical Boxes

1.3 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable standards are as follows:
1. ANSI/IEEE C2 - National Electrical Safety Code
2. NFPA 70- 2005 - National Electrical Code
3. DILHR Chapter 16 - Wisconsin Electrical Code
4. TIA/EIA Standards 526-14A (OFSPT-14A), 568B.2 (Category 6), 568B.3, 569A, 606A, and 607
5. IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

1.4 DESIGN INTENT

A. The Horizontal (Station) Cabling System is based on the installation of 4-Pair Unshielded Twisted Pair (UTP) DATA Category 6 Copper Cables. The cables shall be installed from the Standard Information Outlet (SIO) in the work area to the Telecommunications Room (TR) or Equipment Room (ER) serving that area and terminated as specified in this document.

B. Station cables shall be installed in conduit, and cable tray. Outlets shall be mounted flush on a wall-mounted box, and surface mount jacks. Information Outlet locations are to be identified on Project Drawings.

C. At the Main Equipment Room (125) Data terminations shall be mounted in freestanding equipment cabinets. In the telecommunications Rooms, data and fiber optic terminations shall be in wall-mounted equipment racks.

D. All cables and related termination, support and grounding hardware, bonding, shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following section[s].

E. The Contractor shall provide all labor and materials necessary to construct the system as described herein. This includes - but is not limited to - furnishing and installing cable, cable supports, racking and termination components, termination, testing, labeling and documentation.

1.5 WORK SEQUENCE

A. During the construction period, coordinate telecommunications schedule and operations with the owner (Sedgwick County Adult Detention Facility).

1.6 SUBMITTALS

A. Under the provisions of Section 26 05 00 and Division 01, prior to the start of work the Contractor shall submit:
   1. six (6) sets of Manufacturer's Data covering all products proposed indicating construction, materials, ratings and all other parameters identified in Part 2 (Products) below.
   2. manufacturer's installation instructions, and
   3. Submittals should be grouped to include complete documentation of related systems, products and accessories in a single submittal. Where applicable, dimensions should be marked in units to match those specified.

B. Submittals shall be original catalog sheets, photocopies, or electronic format (ADOBE Portable Document format ".pdf") thereof. Facsimile (fax) sheets shall not be accepted.

C. Work shall not proceed without the Engineer's approval of the submitted items.

D. If materials are furnished as specified no further qualifications is necessary, except for items requiring shop drawings. However, if the Contractor wishes to substitute another manufacturer and/or catalog number, the following information in triplicate shall be submitted to the Engineer:
   1. A complete description of the material which the contractor proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to the Owner.

E. The Contractor shall receive approval from the Engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the Engineer.

1.7 PROJECT RECORD DOCUMENTS

A. Submit and record documents under provisions of 26 05 00.

B. Accurately record exact sizes, locations and quantities of cables.

1.8 QUALITY ASSURANCE

A. The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in producing cable and/or accessories similar to those specified below.

B. The contractor shall have been in this line of business for a minimum of five (5) years and completed four (4) jobs of the magnitude specified in the following sections.

C. The installing contractor shall have at a minimum one (1) Certified Installer trained to the latest industry standards to ensure the most reliable installation available. The Certified Installer shall have been trained by a company that offers a minimum fifteen (15) year system warranty.

1.9 DRAWINGS

A. It shall be understood that the electrical and telecommunication details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within ten (10) days prior to the Bid Due Date.

PART 2 - PRODUCTS

2.1 HORIZONTAL MEDIA (STATION CABLES)

A. General
   1. The Horizontal (Station) Cable System is based on the installation of Un-shielded Twisted Pair (UTP) DATA Category 6 copper cables to install from the work area to the wiring hub locations(s). Refer to the Floor plan Drawings(s) which identify the location of the wiring hubs and Standard Information Outlets (SIO) locations.
   2. Data Station Cables shall be constructed of individually twisted pairs with 24-AWG insulated solid copper conductors.
   3. All Cables and Termination hardware shall be technically compliant with and installed in accordance with the referenced TIA/EIA documents.
   4. All cables shall be suitable for installation in the environment defined and shall meet a CMP/OFNP rating (or approved substitutes as defined by the 2005 NEC).
   5. Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.
   6. Pairs of all 4-pair cables shall be unshielded and shall be identified by a banded color code in which conductor insulation is marked with a dominant color and banded with a contrasting color. By pair number, the pair colors or dominant band are:
      a. Pair 1: Tip - White/Blue; Ring - Blue (or Blue/White)

b. Pair 2: Tip - White/Orange; Ring - Orange (or Orange/White)
c. Pair 3: Tip - White/Green; Ring - Green (or Green/White)
d. Pair 4: Tip - White/Brown; Ring - Brown (or Brown/White)

B. Horizontal Data (Copper)
1. All horizontal Data Station Cables shall terminate on modular Patch Panels in their respective Telecommunications Rooms (TR) or Equipment Room (ER) as specified on the drawings.
2. All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.
3. Transmission characteristics of the Data Station Cables shall meet full Category 6 performance criteria as defined by the referenced TIA/EIA documents. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Cable is a part.
4. IMPORTANT: Cable and Termination Components (Jack, Patch Panel, Wiring Blocks) are specified to function as a System. The compatibility of the Cable to be installed with the proposed termination components shall be recognized and documented by the Termination Component Manufacturer.
5. The jacket color for Data cables shall be ***Orange.***
6. Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages that incorporate a rotating reel.

2.2 INFORMATION OUTLET

A. Station cables shall each be terminated at their designated workstation location in the connector types described in the sub-sections below. Included are modular jacks (Data). These connector assemblies shall snap into a mounting frame and exit flush. The combined assembly is referred to as the Standard Information Outlet (SIO).

B. SIO mounting configurations shall be as follows:
1. Flush where existing boxes are in place
2. All data jacks shall exit the faceplate flush.

C. The Telecommunications Outlet Frame shall accommodate:
1. a minimum of four (4) Modular Jacks, when installed on a ceiling-mounted assembly
2. the outlet frame shall incorporate a mechanism for adjusting the surface plate to a plumb position

D. Multiple Jacks - identified in close proximity on the drawings (and not separated by a physical barrier) - may be combined in a single assembly. The contractor shall be responsible for determining the optimum compliant configuration based on the products proposed and documenting these in the as-built records.

E. The same orientation and positioning of Jacks and Connectors shall be utilized throughout the installation. Prior to installation, the Contractor shall submit the proposed configuration for each SIO type for review by the Engineer.

F. Where stand-alone "Data" only Jacks are identified, the SIO Frame shall be configured as to allow for the addition of one (1) additional jack (Data) to be installed to supplement each such jack as defined by this project. The installation of these supplemental Jacks IS NOT part of this project.

G. Any unused jack positions shall be fitted with a removable blank inserted into the opening.

H. Data Jacks
   1. Data jacks shall be an 8-pin Modular Jack. Coordinate to match existing.
   2. The interface between the jack and the station cable shall be insulation displacement type contact. Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination
   3. Data Jacks shall be pinned TIA-568B with the pairs as follows:
      a.
      b. TIA-568B: Pair 1 - Pins 5 & 4
      c. Pair 2 - Pins 1 & 2
      d. Pair 3 - Pins 3 & 6
      e. Pair 4 - Pins 7 & 8
   4. Transmission characteristics of the Data Jack shall be as required to meet the TIA/EIA Category 6 performance criteria. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Jacks are a part.
   5. The Jack shall be UL verified and listed.
   6. Jack contacts shall have a minimum of 50 micro-inches of gold plating.
   7. The color of the Data Jack shall be ***Orange***. Where used for another application a color unique from the data jack shall be used. Alternately, a color-coded Bezel or Icon may be used to identify the Data Jack.

2.3 DATA PATCH PANEL

A. Manufacturer:
   1. Comscope
   2. Uniprise

B. Data cabling shall be terminated at the Main Equipment Room on panels incorporating Modular Jacks meeting the specifications for the Telecommunications Outlet detailed in the Section above.

C. At the Main Equipment Room, these panels shall be rack mounted.

D. The Data Patch Panel shall consist of a Modular to insulation displacement type contact system. Modular jacks shall meet the specifications detailed above (NON-KEYED 8-pin).

E. The single patch panel configuration shall provide 48 ports in a 2 RU panel. Panels which are modular shall be fully populated (all ports occupied by jacks).

F. The Patch Panel blocks shall have the ability to seat and cut 8 conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Data blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

G. The Data Patch Panel as a system (including jack, cable interface and intermediate components) must maintain Category 6 performance per the referenced TIA/EIA documents. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.

H. Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to insure that all manufacturers minimum bend radius specifications are adhered to.

I. The Patch Panel shall have color coded designation strips to identify cable count.

J. Transmission performance shall be maintained by the Data Patch Panel as a system (including jack, cable interface and intermediate components).

2.4 EQUIPMENT CABINET

A. Equipment Cabinets (wall mount)
1. Where identified on the drawings, wall mounted equipment cabinets shall house all termination components installed under this contract.
2. The cabinets shall be constructed of painted 16-gauge Steel.
3. The cabinet shall incorporate multiple knock-outs for cable access.
4. The Door shall be solid and lockable. The door shall be able to be flipped from side to side so that it can be opened from either the right or the left side. The lock shall come with 2 keys for every cabinet installed and the same key shall be useable for all cabinets installed. Louvers for cooling shall be located on the side of the cabinet and a grille shall be provided on the bottom for a cooling fan should it be necessary in the future.
5. The cabinet shall be at least 24-inches in width. Hardware mounting depth (from front of channel upright to side or bottom panel) shall be 18-inches (minimum). The cabinet shall have a load-bearing capacity of 200 -lbs or greater.
6. Each cabinet shall be supplied with a minimum of twelve (12) releasable (e.g. "hook & loop") cable support ties and shall be supplied with a supply of spare screws (minimum of 12).
7. The cabinet shall have a provision for mounting a power outlet inside the cabinet. The outlet shall be wired by the electrical contractor.
8. Acceptable examples of the wall mount equipment cabinets are Chatsworth, part number 11901-X24.

B. Jumper Management
1. Rack shall be equipped with Vertical and Horizontal Jumper Management Hardware in the form of rings and guides, as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment.
a. Each rack shall be supplied with a minimum of twelve (12) releasable (e.g. "hook & loop") cable support ties.

2.5 FIBER-OPTIC CABLING

Multi-mode Optical Fibers (50-micron core) LASER-Optimized

Fiber Type: Multi-mode; doped silica core surrounded by a concentric glass cladding.

ISO/IEC type OM3

Fiber shall be meet requirements of TIA-492AAAC Detail Specification for 850 nm LASER-Optimized, 50/125 μm, Class 1a Graded-Index Multimode Optical Fibers.

Fiber Coating Diameter: 250 μm (nominal) primary coating; 900 μm (nominal) secondary coating where tight buffer cable design is specified.

All coatings shall be mechanically strippable without damaging the optical fiber.

Attenuation (max. @ 23±5 °C; Backbone):
@ 850 nm 3.0 dB/km
@ 1300 nm 1.0 "

Bandwidth (min.):
OFL 1500-MHz*km @ 850 nm; 500 MHz*km @ 1300 nm

EMB 2000-MHz*km @ 850 nm

No multi-mode optical fiber shall show a point discontinuity greater than 0.2 dB at the specified wavelengths. Such a discontinuity or any discontinuity showing a reflection at that point shall be cause for rejection of that fiber by the Owner.

2.6 FIBER-OPTIC CONNECTORS

The Optical Connector shall be LC duplex-type.

The connector ferrule shall be ceramic or glass-in-ceramic.

The optical fiber within the connector ferrule shall be secured with an adhesive or mechanical process to prevent pistoning and other movement of the fiber strand.

The use of connector designs that feature a pre-cleaved fiber stub and factory polished connector assembly are acceptable. Acceptable means for mating the cabled fiber with the fiber stub include mechanical and fusion splice methods.

The Connector Body shall be a Composite material.

The attenuation per mated pair shall not exceed the following values:

Multimode 0.5 dB (individual); 0.3 dB (average)

These values shall hold throughout the Cable System. Connectors shall sustain a minimum of 200 mating cycles per EIA/TIA-455-21 without violating specifications.

The connector shall meet the mechanical performance criteria of the applicable EIA/TIA-455 Fiber Optic Test Procedures (FOTP).

Color of Connector Body or strain-relief boot shall indicate fiber type as follows:

Multimode (50-micron; LASER-optimized) OM3 – Aqua

Multi-mode only (if applicable):
Connector End-Face finish shall be a high-performance, spherically polished design (e.g. Ultra Physical Contact; UPC).

Reflectance shall be -25 dB or better when mated with a patch-cord made up of connectors of comparable design.

Enclosure and Coupling Panels

All terminated fibers shall be mated to Duplex LC. Couplers shall be mounted on a panel that, in turn, snaps into the enclosure. The proposed enclosure shall be designed to accommodate a changing variety of connector types.

Color of Connector Coupling (all except ST-type) shall indicate fiber type as follows:

Multimode (50-micron; LASER-optimized) OM3 – Aqua

Fiber Optic Patch Panels shall be rack-mounted.

Fiber Optic Patch Panel enclosure shall be sized to accommodate the total fiber count to be installed at each location as defined in the specifications and drawings - including those not terminated (if applicable).

Unit height shall be 2 RU minimum to simplify access.

Fiber Optic Patch Panel shall be enclosed assemblies affording protection to the cable subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or retractable front cover designed to protect the connector couplings and fiber optic jumpers.

The patch panel enclosure shall provide for strain relief of incoming cables and shall incorporate radius control mechanisms to limit bending of the fiber to the manufacturer's recommended minimums or 1.2", whichever is larger.

Access to the inside of the patch panel enclosure during installation shall be from the front and/or rear. Panels that require any disassembly of the cabinet to gain entry will not be accepted.

All Fiber Optic Patch Panels shall provide protection to both the "facilities" and "user" side of the coupling. The patch panel enclosure shall be configured to require front access only when patching. The incoming cables (e.g. Backbone, Riser, etc.) shall not be accessible from the patching area of the panel. The enclosure shall provide a physical barrier to access of such cables.

PART 3 - EXECUTION

3.1 GENERAL

A. Counts of the cables to be supplied are detailed on the Project Drawings and below. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified above. It shall be noted that all cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed.

B. Refer to Project Drawings which indicate the cable routes to follow and the termination location(s)

C. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.

D. Beginning installation means contractor accepts existing conditions.

E. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
   1. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away" or other approved method.
   2. The contractor will be responsible for identifying and reporting to the Site Coordinator(s) any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the Contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

F. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

G. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

H. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed. If any installed cable is kinked to a radius less than recommended dimension it shall be replaced by the contractor with no additional cost to the project.

I. All wiring shall be run "free-air", in conduit, in a secured metal raceway or in modular furniture as designated on the floor plan(s). All cable shall be free of tension at both ends.

J. Avoid abrasion and other damage to cables during installation.

K. Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.

L. The Cable system will be tested and documented upon completion of the installation as defined in the Section below.

M. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

N. Should it be found by the Engineer, that the materials or any portion thereof, furnished and installed under this contract, fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

3.2 SYSTEM TOPOLOGY AND CABLE SIZE REQUIREMENTS

A. Backbone Cabling (Riser & Tie)
   1. Backbone Cables shall be installed to link telecommunications rooms including:
      a. Main Equipment Room (Room 125)
         1) The following details the requirements relating to each cable type.
      b. Station Cabling
         1) Information Outlets cables with copper media (Data UTP) shall be located as detailed on the Project Drawings.
         2) The Bidder in determining materials quantities and routing should utilize these documents.
         3) Station Cabling on each Floor shall be routed to the Telecommunications Room (TR) on that floor or to the designated TR if on another floor.
         4) Station cables shall be run to the Information Outlet from the Telecommunications Room serving each area in conduit,

free-air above drop ceiling, in cable tray and/or in modular furniture.

5) The maximum station cable drop length for Data UTP (Category 6) shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the Engineer prior to installation. Changes to the plan shall be approved by the Engineer. All cables shall be installed splice-free unless otherwise specified.
6) Avoid abrasion and other damage to cables during installation. Damaged cables shall be replaced at the contractor's expense.
7) All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
8) Where installed free-air, installation shall consider the following*:*
    a) Cable shall run at right angles and be kept clear of other trades work.
    b) Cables shall be supported according to code utilizing "J-" or "Bridal-type" mounting rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
    c) Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6-inches, another support shall be used.
    d) Cable shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
    e) Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
9) Manufacturer's minimum bend radius specifications shall be observed in all instances.
10) Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
11) Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
12) A coil of 4 feet in each cable shall be placed in the ceiling at the last support (e.g. J-Hook, Bridal Ring, etc.) before the cables enter a fishable wall, conduit, surface raceway or box. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

13) To reduce or eliminate EMI, the following minimum separation distances from ≤480V Power lines shall be adhered to:
    a) Twelve (12) inches from power lines of <5-kVa.
    b) Eighteen (18) inches from high voltage lighting (including fluorescent).
    c) Thirty-nine (39) inches from power lines of 5-kVa or greater.
    d) Fourty-seven (47) inches from transformers and motors.
14) All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.
15) IMPORTANT: Within the room in which Data Cabling is to be terminated, Hook and Loop (e.g. "Velcro") ties only shall be used from room entry to the point of termination. This is to facilitate the addition of future cables. Use of Cable ties prohibited. Provide Velcro ties only.

B. Information Outlet
1. General
a. Information Outlets shall be surface mounted jacks in above ceiling locations. Where there are information outlets in open areas, cabling shall installed in conduit and surface mounted boxes.
b. Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Site Coordinator and the Engineer. Nominal height (from finished floor to center line of Outlet) in new installation shall be as follows:
1) Standard Data Outlet: Mounted on or in ceiling

3.3 CABLE TERMINATION

A. General
1. At the Telecommunications Rooms, all Data Cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number. Exceptions to the sequencing of terminations is allowed only with the permission of the project manager and A/E.
2. Termination Hardware (Blocks and Patch Panels) Positioning and Layout must be reviewed and approved by the Engineer prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.

B. Cable Termination - Data UTP
1. Data Patch Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.
2. Data Patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.
3. At Information Outlets and Data Patch Panels, the installer shall insure that the twists in each cable pair are preserved to within 0.5-inch of the termination for Data cables. The cable jacket shall be removed only to the extent required to make the termination.

C. Equipment Cabinet (Free Standing)
1. Equipment cabinets shall be furnished and installed in the following quantities:
a. Main Eqpt. Room (Rm. 125) one (1)

2. The Contractor shall assemble and level the cabinet as recommended by the manufacturer.
3. Spaces for future cabinets are shown on the drawings and shall be maintained by this contractor.
4. All hardware and equipment is to be mounted between 18" and 79" above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware should be reviewed and approved by the Engineer and Site Coordinator(s) prior to installation.
5. The rack(s) shall be grounded to the Telecommunications Ground Bussbar (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket or GREEN jacket with one or more yellow stripes). (See NEC 2002, section 250.119.)

D. Equipment Cabinet (wall mount)
1. Equipment cabinets shall be furnished and installed in the following quantities:
   a. Main Eqpt. Room (Rm. 125) zero (0)
2. The Contractor shall install the cabinets on the wall as designed by the manufacturer. The cabinets shall be level.
3. Spaces for future cabinets are shown on the drawings and shall be maintained by this contractor.
4. All hardware and equipment is to be mounted between 18" and 79" above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware should be reviewed and approved by the Engineer and Site Coordinator(s) prior to installation.
5. The rack(s) shall be grounded to the Telecommunications Ground Bussbar (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket or GREEN jacket with one or more yellow stripes).

E. Identification and Labeling
1. Station Cable and Termination Components:
   a. Individual labels shall be placed on all Telecommunications Outlets, Data Patch Panels, and cables. This is inclusive of each, data, or fiber optic outlet, or any configuration thereof, as identified on the drawings.
   b. Each component shall be clearly labeled using a code identifying each information outlet location throughout the facility. The project documents identify the numbering at each outlet location. Each media type shall be numbered separately.
      1) Naming convention should be Room Number, Patch Panel, then port.
      2) Example: Room 126
Patch Panel A
Port number 4
"126A04"
   c. Telecommunications Outlets are to be labeled 1) on the cover of the assembly and 2) on each cable terminated at that location.
   d. All new outlet faceplates shall incorporate recessed label holders and shall be fitted with clear plastic covers. Where no such label holders are present on existing to remain outlets, the faceplate labels shall be protected with a clear over-laminate.
   e. Labels shall be White background with Black lettering. Lettering size shall be as large as practicable (up to 16-point) to fit properly on the outlet label. No lettering shall be smaller than 12-point.
   f. Copper Data and Fiber Optic Patch Panels shall be labeled identifying Outlet ID. Modular Jacks and/or Fiber Couplers shall be

positioned in sequence of Outlet ID. Fiber Panels shall also be labeled with the fiber number. Fibers shall be sequenced in order per the manufacturer's color code.

g. Each Station Cable shall be labeled within 4-inches of the cable end at the Data Patch Panel, and Information Outlet.

3.4 COMMUNICATION BACKBONE, RISER AND TIE CABLE LABELING

A. All fiber optic backbone cables shall be identified AT BOTH ENDS with a designation that identifies where the opposite end of the same cable terminates (e.g. Equipment Room or Telecommunications Closet I.D.). In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.

B. Each fiber optic termination panel shall be clearly labeled indicating the destination of the cable(s) and the fiber number of each fiber position. The cable identifiers are to be secured to (1) the side and (2) the front cover of the panel enclosure.

C. Work by Owner
1. NONE.

D. Cooperation
1. The Contractor shall cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the owner, provided such decision is reached prior to actual installation. The Contractor shall check the location of electrical outlets with respect to other installations before installing.

3.5 TESTING AND ACCEPTANCE

A. General
1. The contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed
2. All tests shall be documented and submitted to the Engineer.
3. The Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. Prior to testing, the Contractor shall provide a summary of the proposed test plan for each cable type including equipment to use used, set-up, test frequencies or wavelengths, results format, etc. The method of testing shall be approved by the Engineer.
4. The Contractor shall visually inspect all cabling and termination points to insure that they are complete and conform to the wiring pattern defined herein. The contractor shall provide the Engineer with a written certification that this inspection has been made
5. The Contractor shall conduct acceptance testing according to a schedule coordinated with the construction manager. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall provide a minimum of one (1) week advance notice to the Engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.
6. IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.
7. Tests related to connected equipment of others shall only be done with the permission and presence of Contractor involved. The Contractor shall

ascertain that testing only as required to prove the wiring connections are correct.

8. The Contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used and the procedures followed. At the request of the Engineer, the contractor shall provide copies of the original test results.
9. All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.
10. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

B. Data Station Cabling (Category 6)

1. Testing shall be from the Jack at the SIO to the Data Patch Panel at the TR on which the cables are terminated. When the SIO is located on/in the wall behind modular furniture, a patch cord may be inserted into the SIO to allow the furniture to be returned to its normal location. Cat 6 cable testing, in this case, will be done with the patch cord. The cabling must pass all Cat 6 TIA requirements.
2. Horizontal “Station” cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.
3. Testing of the Cabling Systems rated at TIA Category 6 shall be performed to confirm proper functioning and performance.

C. Category 6 Performance Testing

1. "In addition to the above, Performance Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6) shall include the following:
   a. Length
   b. Attenuation
   c. Pair to Pair NEXT Loss (new limits)
   d. PSNEXT Loss
   e. Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
   f. PSELFEXT Loss
   g. Propagation Delay
   h. Delay Skew
   i. Return Loss
2. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.
3. Category 6 testing shall be per ANSI/TIA/EIA 568B.2 Permanent Link test configurations and ANSI/TIA/EIA 568B.2 Category 6.
4. The maximum length of station cable shall not exceed 90 meters which allows 10 meters for equipment and patch cables. Worst case performance at 20℃, based on a Horizontal Cable length of 90 meters and Equipment Cord length of 4 meters, shall be as follows:
   a. Category 6 Test Parameters:

Category 6 Cable
Permanent Link Test

Frequency	TIA/EIA 568B.2-1 Insertion Loss Attenuation	TIA/EIA 568B.2-1 NEXT Worst Pair to Pair	TIA/EIA 568B.2-1 PSNEXT Worst Case Loss	TIA/EIA 568B.2-1 ELFEXT Worst Pair to Pair Loss	TIA/EIA 568B.2-1 PSELFEXT Loss	TIA/EIA 568B.2-1 Return Loss
MHz	Max. dB	dB	dB	DB	dB	dB
1.00	1.9	65.0	62.0	64.2	61.2	19.1
4.00	3.5	64.1	61.8	52.1	49.1	21.0
8.00	5.0	59.4	57.0	46.1	43.1	21.0
10.00	5.5	57.8	55.5	44.2	41.2	21.0
16.00	7.0	54.6	52.2	40.1	37.1	20.0
20.00	7.9	53.1	50.7	38.2	35.2	19.5
25.00	8.9	51.5	49.1	36.2	33.2	19.0
31.25	10.0	50.0	47.5	34.3	31.3	18.5
62.50	14.4	45.1	42.7	28.3	25.3	16.0
100.00	18.6	41.8	39.3	24.2	21.2	14.0
200.00	27.4	36.9	34.3	18.2	15.2	11.0
250.00	31.1	35.3	32.7	16.2	13.2	10.0

D. Propagation Delay

1. The maximum propagation delay determined in accordance with the ANSI/TIA/EIA –568B.2 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In determining the permanent link propagation delay, the propagation delay contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 100MHz).

E. Delay Skew

2. For all frequencies from 1 MHz to 250 MHz, Category 6 cable propagation delay skew shall not exceed 44ns/100m at 20 degrees C, 40 degrees C, and 60 degrees C. In addition, the propagation delay skew between all pairs shall not vary more than +/- 10ns from the measured value at 20 degrees C when measured at 40 degrees C and 60 degrees C. Compliance shall be determined using a minimum 100m of cable.
3. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or user agency.

3.6 DOCUMENTATION

A. General

1. Upon completion of the installation, the contractor shall provide three (3) full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation of Test Results shall be submitted in electronic form. Electronic documents may be submitted on CD-ROM for review and distribution. Where documentation provided in electronic form requires unique software (other than an MS-Word™ compatible Word Processor or MS-Excel™ spreadsheet) for viewing test results, the Contractor shall provide along with the above documentation, one (1) licensed copy of such software. The software shall run on a MICROSOFT *Windows*-based personal computer supplied by the Owner.

3. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and *draft* as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
4. The Engineer may request that a 10% random field re-test be conducted on the cable system at no additional cost to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

B. Test Data – Fiber-Optic Media

General

The fibers utilized in the installed cable shall be traceable to the manufacturer. Upon request by the Owner, provide cable manufacturer's test report for each reel of cable provided. These test reports shall include:

a) Manufacturer's on the reel attenuation test results at the specified wavelengths for each optical fiber of each reel prior to shipment from the manufacturer.

b) On-the-reel Bandwidth performance as tested at the factory.

Tests Prior to Installation

At Contractor discretion and at no additional cost to the Owner, Contractor may perform tests deemed necessary by the Contractor to ensure integrity of any Owner furnished optical fiber. Tests may range from a simple "flashlight test" to an OTDR of each optical fiber of each cable reel prior to installation. Upon request, the contractor shall supply this test data to the Engineer prior to installation.

Tests After Installation

Upon completion of cable installation and termination, test Fiber Optic cabling to include:

Optical Attenuation ("Insertion Loss" Method)

Verification of Link Integrity (OTDR)

Optical Attenuation Testing

Measure Optical Attenuation on all terminated optical fibers in both directions of transmission using the "Insertion Loss" method. Measurement shall be inclusive of the optical connectors and couplings installed at the system endpoints. 1 to 5 meters (3.3 to 16.4 ft)

Multi-mode fibers shall be tested in accordance with the EIA/TIA 526-14A, Method B at 850±30 nm.

Attenuation of optical fibers (all fiber types) shall not exceed the values calculated at follows:

Multimode fiber where cable length ≤ 300-meters and includes no splices – 2.0 dB

Cable > 300-meters or any cable containing splices – 2*C+L*F+S dB;

Where C is the maximum allowable Connector Loss (in dB), L is the length of the run (in kilometers) and F is the maximum allowable fiber loss (in dB/km). S is the total splice loss (# of splices * max. attenuation per splice).

OTDR Testing
Document all fibers - even those that are left un-terminated (if applicable) - in one direction of transmission using an Optical Time Domain Reflectometer (OTDR).

Test multimode fibers at 850 nm (nominal).

The OTDR(s) shall incorporate high-resolution optics optimized for viewing of short cable sections. Set Pulse Width to shortest width usable and still obtain clean trace.

Use access jumpers of adequate length to allow viewing of the entire length of the cable, including the connectors at the launch and receive end.

OTDR traces revealing a point discontinuity greater than 0.2 dB in a multi-mode fiber, at any of the tested wavelengths or any discontinuity showing a reflection at that point shall be a valid basis for rejection of that fiber by the Owner. The installation of that cable shall be reviewed in an effort to remove any external stress that may be causing the fault. If such efforts do not remove the fault, that cable and the associated terminations shall be replaced at the expense of the contractor.

C. Test Data - Copper Media
   1. Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
   2. Printouts generated for each cable by the wire test instrument (e.g. *Fluke*) shall be submitted as part of the documentation package. The contractor shall furnish this information in electronic form on CD-ROM.

3.7 AS-BUILT CONSTRUCTION DRAWINGS

A. Drawings included with the specifications set shall be modified by the contractor to denote as-built information.

B. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons and drawing conventions used shall be consistent throughout all documentation provided.

C. The A/E Consultant shall provide floor plans in paper and electronic (".dwg", *AutoCAD* rel. 2009) formats on which as-built construction information can be added. These documents will be modified accordingly by the contractor to denote as-built information as defined above and returned to the Consultant for acceptance. This information shall be supplied to the Consultant/Engineer no later than four (4) weeks prior to the scheduled occupancy of the affected floors.

D. The Contractors shall annotate the base drawings and return to the A/E in hard copy (same plot size as originals) and electronic (*AutoCAD* rel. 2009) form.

E. Each drawing submitted by the Contractor as part of the Project Documentation shall be identified as an "As-built" drawing and include the following (1) The Contractor name and/or logo (2) The date of the drawing.

F. All fonts, color, layer, Model Space/Paper Space conventions established in the base drawings shall be retained by the Contractor in preparation of the As-built drawings.

G. Prior to generation of the drawings, the Contractor shall provide a sample file and test plot to the Engineer for review and approval.

H. All documentation, including hard copy and electronic forms shall become the property of Sedgwick County.

3.8 WARRANTY

A. This Contractor shall guarantee all materials, equipment, etc., two (2) years from date of substantial completion of this work. In the case of data cabling the contractor shall furnish complete Category 6 system warranty consisting of no less than fifteen (15) years. This guarantee shall include all labor, material and travel time. In the case of multi-mode fiber cabling the contractor shall furnish a complete system warranty consisting of no less than fifteen (15) years. See Division 01, GENERAL CONDITIONS, and GENERAL REQUIREMENTS - Guarantee Documents for further requirements.

END OF SECTION

SECTION 28 05 10
SEQUENCING OF SECURITY ELECTRONICS WORK

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 JOB CONDITIONS

A. The existing buildings security alarm, communication and video surveillance systems shall remain in service during construction. Outages and interruptions in these systems shall be held to a minimum and shall be done at a time convenient to the Owner. The time of all outages shall be scheduled with the Owner and all other trades affected by the outage at least ten working days in advance. All work shall be scheduled at periods and times acceptable to the Owner.

1.3 COORDINATION WITH OWNER

A. The Owner realizes the difficult nature in replacing the systems and maintaining security operations and will cooperate with the Contractor in accommodating system outages. The Security Contractor is responsible for producing a schedule of events with his subcontractors, the Owner and Engineer to establish a sequence by which system replacement can be done with as little disruption as possible. The schedule of events shall include the following:
   1. Area or areas affected by the scheduled event.
   2. Systems affected by the event.
   3. Time duration for the event.

B. The Security Contractor shall attempt to keep system outages confined to individual systems where possible and also confined to individual areas, such as Intake, Housing, etc. The Security Contractor along with the Owner and Engineer will work closely to establish a priority list identifying which systems can be disconnected and at what times during the day.

C. In coordinating the installation of new systems to replace the existing, the Owner will make arrangements for one or more of the following:

D. The addition of corrections staff to secure areas where systems may be turned off.
   1. Movement of juveniles to vacate certain areas of the building during construction.
   2. Supply radios to corrections staff to maintain security communications.
   3. Adjustments to schedules for other functions that will occur in the building, i.e. visiting.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.1 REMOVAL

A. Provide temporary wiring to any system that is to remain in operation during system replacement and whose power would be interrupted as a result of replacement.

B. Remove electrical and security equipment released from service as a result of system replacement or as indicated on drawings.

C. Do not reuse removed electrical and security equipment except as specifically directed on the drawings.

D. Where the plans require existing equipment to be removed or relocated, removal shall include all equipment associated with the device. Associated equipment shall include but not be limited to power supplies, relays, interface boards, de-energized conductors, etc. In instances where a device is removed but active conductors remain in the backbox and the box is mounted in a wall which is remaining, the backbox may remain and a blank coverplate provided. If removal of the box is specifically indicated on the plans the active conductors shall be intercepted at convenient, accessible locations and rerouted to allow existing box to be removed.

3.2 DISPOSAL

A. Dispose of equipment that is removed unless specifically indicated on the drawings.

B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

C. The Contractor shall review the systems with the Owner to determine the status of all other equipment to be removed during system replacement. All equipment that is to be salvaged for reuse by the Owner shall be removed by the Contractor and transported to a owner designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

D. Contractor, at his option, may install new conductors in existing raceways provided that the raceways are in place and are properly sized and supported. Existing conduits that are removed from their existing location shall not be reinstalled.

E. Cables in conduit to be abandoned and not reused will be removed from the conduit, conduit shall remain. Cables abandoned and not reused located exposed above ceilings shall be removed.

END OF SECTION

SECTION 28 05 20
SECURITY SYSTEM EQUIPMENT RACKS AND ENCLOSURES

PART 1 - GENERAL

1.1 SCOPE

A. Prefabricated metal equipment racks for security controls as detailed on the Drawings and as specified herein.

1.2 RELATED WORK

A. Section 28 46 00 - Security System General Requirements

B. Section 28 46 10 – Security System Control and Monitoring

C. Section 28 46 20 – Security System Network Switches

D. Section 28 46 30 –Voice Communication System

E. Section 28 46 40 – Card Access System

F. Section 28 46 50 – Duress Alarm System

G. Section 28 46 60 – Video Surveillance System

1.3 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:
   1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

PART 2 - PRODUCTS

2.1 EQUIPMENT RACKS – FREESTANDING

A. Provide freestanding self-supporting equipment racks for all security equipment (PLC's, relays, power supplies and video equipment) for the following equipment racks as indicated on the drawings:
   1. PLC-J
   2. VCS-ER
   3. VSS-ER

B. The rack assembly shall be welded construction 14 gauge steel with 11 gauge mounting rails drilled and tapped for 10-32 thread on universal 19" wide equipment space and EIA hole vertical spacing shall be adjustable from front to rear.

C. Depth as required to accommodate the equipment contained within. Equipment rooms have been designed assuming a double sided 30" deep X 25" wide rack module. The racks are wider to accommodate additional cable pulling space. Racks shall be sized to accommodate all equipment, termination and cabling space. All doors will be closed and locked when installation is complete.

D. The front and rear doors shall be formed and reinforced with vertical center support channel. A spring hinge for rear door removal and a three-point chrome-locking handle shall be provided. Rear door and sides shall be louvered and removable for access to equipment. Provide all racks with cooling fans.

E. Rear door and sides shall be louvered and removable for access to equipment.

F. Provide blank fillers for unused mounting spaces.

G. Provide multi-outlet plug strips as required for the rack mounted equipment.

2.2 MILLWORK MOUNTED PC COOLING FANS

A. SEC to provide cooling fans in new millwork units at Officer Workstations as shown on Architectural Drawings under Alternate Bid No. 3.

B. Mount cooling fan on cabinet side and exhaust towards officer leg space.

C. Provide all mounting hardware as required for millwork application.

D. Provide two 4.7" 50cfm flush mounted whisper fan per officer station similar to Lowell Manufacturing LWF-195-2 (3RU).

2.3 ACCEPTABLE MANUFACTURERS

A. AMCO

B. Emcor

C. Home

D. Middle Atlantic Products

E. Winsted

PART 3 - EXECUTION

3.1 PRE-INSTALLATION

A. Prior to delivery of equipment racks, the SEC Contractor shall visit the site to review conditions under which the racks are to be installed. Equipment racks shall not be installed until the room is:
   1. Free of construction dust, swept and mopped.
   2. Final painted.
   3. Adequate ventilation and/or air conditioning (permanent building system or temporary) is installed.
   4. Adequate lighting (permanent building or temporary) is installed.
   5. Room is secured either temporarily or using permanent doors.

3.2 INSTALLATION

A. Field verify actual dimensions for suitability of placement of equipment. Notify engineer of any discrepancies or conflicts prior to the ordering of equipment racks or consoles.

B. EQUIPMENT RACK MOUNTING:

1. Equipment shall be arranged in the rack, according to the following considerations:
    a. Usage - Equipment which will require adjustment or will be manually operated and/or adjusted shall be placed at a height which is convenient to an operator, from a standing position at the rack.
    b. Cooling - Equipment shall be arranged in a manner, which allows proper cooling of the equipment – allow space and vented blank rack plates between the amplifiers and other equipment within the rack. Maintain a minimum of 1RU between all powered, heat producing equipment.
    c. Center of Gravity – In order to minimize movement / accidental tipping of the rack, heavy equipment, and equipment requiring minimal operator interaction shall be placed in the lower portion of the rack
    d. Appearance - Black-finish equipment mounting screws, which are specifically designed for mounting of equipment into rack cabinets, shall be used wherever they will be visible from the front of the rack.
    e. Plain blank plates shall be furnished, as needed, in order to fill-in all open spaces within the front face of the equipment rack
    f. Vented and perforated blank plates shall be provided, as needed, in order to ensure adequate cooling of the rack-mounted equipment.

3.3 GROUNDING

A. Ground each rack section to the reference ground bus in the security electronics equipment room. Provide a grounding lug for each section and extend #10 AWG green equipment ground conductors from each section.

B. The SS contractor shall provide ground busses in their sections and ground all electronic equipment as required by their installation

3.4 CLEANING AND FINAL INSPECTION

A. After the equipment racks are installed and terminated they shall be cleaned inside and out. Remove all debri within or on top of the racks, i.e. cut ends of cable ends or tye-wraps, papers, etc. Vacuum clean all interiors and equipment using a brush attachment.

B. Rack mounted equipment with internal fans with filters or screens shall be cleaned and all surface dust removed from electronics components.

C. Final inspect all terminations are securely fastened and all plug-in power supplies are secured to their receptacles with tye-wraps.

END OF SECTION

SECURITY CONTROL POINT SCHEDULE PLC-J

POINT NO.	DOOR	ROOM	LOCATION DOOR NO / ROOM NO.	COMMUNICATION COMPONENTS						DOOR CONTROL COMPONENTS										UTILITY CONTROL					CONTROL FROM	ANN. AT	INTER-LOCK WITH	ASSOC. WITH CAMERA	WIRING DIAGRAM SE501	NOTES
				I	C	P				M	E	D	K	MH	Rx	CB	Ks	Kp	CR		T									
J-1	●		VEST	X							2	2							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W1,X1	E	
J-2		●	CTL			X																			-	TS-WA/WB	-	W3,W4	-	
J-3		●	CTL																X						LOCAL	TS-WA/WB	-	-	-	8
J-4	●		SP E								X								2						LOCAL, TS-WA/WB	TS-WA/WB	-	-	C	6
J-5	●		SP E								X								2						LOCAL, TS-WA/WB	TS-WA/WB	-	-	C	
J-6	●		BREAK				X				X	X							X						LOCAL, TS-WA/WB	TS-WA/WB	--	-	F	16
J-7		●	BREAK						X																TS-WA/WB	TS-WA/WB	-	-	-	12
J-8	●		POD A	X							X	X							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W8,W18	E	
J-9		●	POD A						6																TS-WA/WB	TS-WA/WB	-	W7,W10	-	13
J-10		●	POD A																		X				TS-WA/WB	TS-WA/WB	-	-	-	
J-11		●	POD A																				3		TS-WA/WB	TS-WA/WB	-	-	-	3
J-12	●		POD A									X													-	TS-WA/WB	-	-	A	
J-13	●		POD A								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-14	●		SP W								X								2						LOCAL, TS-WA/WB	TS-WA/WB	-	-	C	
J-15	●		SP W	X							X								2						LOCAL, TS-WA/WB	TS-WA/WB	-	W13	C	
J-16	●		POD B	X							X	X							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W13,W20	E	
J-17		●	POD B																				X		TS-WA/WB	TS-WA/WB	-	-	-	
J-18		●	POD B						2																TS-WA/WB	TS-WA/WB	-	W19,W20	-	13
J-19		●	POD B																		X				TS-WA/WB	TS-WA/WB	-	-	-	
J-20	●		POD C	X							X	X							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W13,W21	E	
J-21		●	POD C																		X				TS-WA/WB	TS-WA/WB	-	-	-	
J-22		●	POD C						4																TS-WA/WB	TS-WA/WB	-	W21,W24	-	
J-23	●		POD C									X													-	TS-WA/WB	-	-	A	
J-24	●		POD C								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-25	●		COR								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-26	●		LNDY	X							X	X													TS-WA/WB	TS-WA/WB	-	X2	F	14
J-27	●		MECH									2			X										-	TS-WA/WB	-	-	A	15
J-28		●	LNDY	X																					TS-WA/WB	TS-WA/WB	-	W26,W27	-	
J-29		●	COR						8																TS-WA/WB	TS-WA/WB	-	-	-	12
J-30	●		REC	2							X	X													TS-WA/WB	TS-WA/WB	-	W28,W30	F	14

SECURITY CONTROL POINT SCHEDULE PLC-J

POINT NO.	DOOR	ROOM	LOCATION DOOR NO / ROOM NO.	COMMUNICATION COMPONENTS						DOOR CONTROL COMPONENTS									UTILITY CONTROL					CONTROL FROM	ANN. AT	INTER-LOCK WITH	ASSOC. WITH CAMERA	WIRING DIAGRAM SE501	NOTES
				I	C	P			M	M	E	D	K	MH	Rx	CB	Ks	Kp	CR		T		△						
J-31	●		POD D	X							X	X							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W32,W38	E	
J-32		●	POD D																		X				TS-WA/WB	TS-WA/WB	-	-	-	
J-33		●	POD D						6																TS-WA/WB	TS-WA/WB	-	W32,W35	-	13
J-34		●	POD D																					3	TS-WA/WB	TS-WA/WB	-	-	-	3
J-35	●		POD D									X													-	TS-WA/WB	-	-	A	
J-36	●		POD D								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-37		●	CLASS	X																					TS-WA/WB	TS-WA/WB	-	W39,W40	-	
J-38		●	CLASS			X																			-	TS-WA/WB	-	W39,W40	-	
J-39		●	CLASS						X																TS-WA/WB	TS-WA/WB	-	W39,W40	-	13
J-40		●	CLASS			X																			-	TS-WA/WB	-	W39,W40	-	
J-41	●		COR								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-42	●		POD E	X							X	X							2						LOCAL, TS-WA/WB	TS-WA/WB	-	W37,W44	E	
J-43		●	POD E																		X				TS-WA/WB	TS-WA/WB	-	-	-	
J-44		●	POD E						6																TS-WA/WB	TS-WA/WB	-	W43,W46	-	13
J-45		●	POD E																		3				TS-WA/WB	TS-WA/WB	-	-	-	3
J-46	●		POD E									X													-	TS-WA/WB	-	-	A	
J-47	●		POD E								X	X													TS-WA/WB	TS-WA/WB	-	-	F	14
J-48	●		MECH				X				X	X							X						LOCAL, TS-WA/WB	TS-WA/WB	-	-	F	16
J-49		●	POD A																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-50		●	POD A																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-51		●	POD A																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-52		●	POD B																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-53		●	POD B																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-54		●	POD B																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-55		●	POD C																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-56		●	POD C																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-57		●	POD C																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-58		●	POD D																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-59		●	POD D																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-60		●	POD D																	X					TS-WA/WB	TS-WA/WB	-	-	-	

SECURITY CONTROL POINT SCHEDULE PLC-J

POINT NO.	DOOR	ROOM	LOCATION DOOR NO / ROOM NO.	COMMUNICATION COMPONENTS						DOOR CONTROL COMPONENTS									UTILITY CONTROL					CONTROL FROM	ANN. AT	INTER-LOCK WITH	ASSOC. WITH CAMERA	WIRING DIAGRAM SE501	NOTES
				I	C	P			M	M	E	D	K	MH	Rx	CB	Ks	Kp	CR		T		△						
J-61		●	POD E																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-62		●	POD E																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-63		●	POD E																	X					TS-WA/WB	TS-WA/WB	-	-	-	
J-64	●		CLASS				X				X	X							X						LOCAL, TS-WA/WB	TS-WA/WB	-	-	F	16
J-65	●		CLASS				X				X	X							X						LOCAL, TS-WA/WB	TS-WA/WB	-	-	F	16
J-66		●	POD C																				X		TS-WA/WB	TS-WA/WB	-	-	-	
J-67																														
J-68																														
J-69																														
J-70																														
J-71																														
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J-89																														
J-90																														

SECURITY CONTROL POINT GENERAL NOTES

1. Security Control Points assigned upon logical layout and proximity to nearest equipment closet.
   It is the responsibility of the Contractor to trace existing wiring at each designated control component
   to actual existing relays and determine nearest new equipment rooms for extension of wiring, power and logic.

2. Logic for Security Control Points to reside in the PLC controller as assigned regardelss of actual
   physical relay location.

3. See Drawings for designated raceway location between old equipment closet and new PLC controller.

4. Security Control Points as assigned to be used for touch screen layout and PLC programming.

5. Div. 28 Security Electronics Contractor to provide (1) PLC per equipment room (as shown).
   Provide necessary I/O modules to accommodate actual Control Points in each equipment room
   plus expansion as specified.

6. Security Contorl Point Schedule includes current door numbering. Contractor reponsible for re-tagging
   all existing and new cabling with current (Owner) door/room numbering as scheduled.

7. Security Control Point Schedule indicates primary control of Touch Screen TS-WA and TS-WB.

8. Contractor to provide 12 spare relays for integration of any items requiring integration not shown on these Documents
   it being understood that a complete operational system replacement is required.

SECURITY CONTROL POINT SCHEDULE NOTES

1. Quantity in column indicates number of devices controlled as a single point.
2. Local pushbutton as legal release of door.
3. Quantity in column indicates devices controlled as a single point and as a group.
4. New electrified hardware this Opening. Provide conduit/cable to PLC/J.
5. See Security Electronics plan for interlock requirements this Control Point.
6. Card reader used for operator log-in of touch screen workstation.
7. Quantity in column indicates number of devices controlled individually.
8. Duress alarm to annunciate at TS-WA and TS-WB.
9. Local electric key switch to reset local alarm horn.
10. Motion sensor to release magnetic lock and shunt door position switch so door does not go into alarm.
11. Local push button to release magnetic lock and shunt door position switch so door does not go into alarm.
12. Paging speaker without sound threshold monitoring.
13. Paging speaker with sound threshold monitoring.
14. Door used for emergency egress only. Provide remote monitor/control per Alternate Bid No. 2.
15. Local push button used to shunt door position switch so door does not go into alarm upon egress.
16. This Control Point included under Alternate Bid No. 2.

SECTION 28 46 00
SECURITY SYSTEM GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section shall be included with the work of Division 28 46 00 “Security Electronics Contract” and be considered a part of a singular contract. The Contractor shall be referred to in this specification and on the drawings as the Division 28 SEC (Security Electronics Contractor).

B. A single SEC Contractor shall perform the entire work of this Section. This Contractor shall be regularly engaged in the installation and service of correctional grade electronic security systems including the following:
   1. Section 28 05 20 - Security System Equipment Racks and Enclosures
   2. Section 28 46 10 - Security System Control and Monitoring
   3. Section 28 46 20 – Security System Network Switches
   4. Section 28 46 30 - Voice Communication System
   5. Section 28 46 40 - Card Access System
   6. Section 28 46 50 – Duress Alarm System
   7. Section 28 46 60 - Video Surveillance System

C. The SEC Contractor shall assign a Project Manager as the sole responsible contact person for coordination purposes during the duration of the project. The Project Manager shall be a technically qualified full time employee of the SEC Contractor.

D. It is mandatory that the minimum given specifications be strictly adhered to, so as to provide a high level of quality and the design objectives. There shall be no substitutions allowed that have not been approved by addendum.

E. Specification Section 28 06 00 includes a Security Control Point Schedule for each programmable logic controller location. The schedule indicates the security control, monitoring, communication and video call-up points associated for each PLC along with the primary control and monitoring location. The primary controls and monitoring locations may be transferred to other locations as described in the Contract Documents.

1.2 RELATED WORK

A. Applicable provisions of Division 01 govern work under this Section.

B. Section 07 92 10 – Security Sealants

C. Section 08 71 00 – Door Hardware

D. Section 11 19 00 – Detention Equipment General Requirements

E. Section 11 20 00 – Security Fasteners

F. Section 26 05 00 – General Electrical Provisions

G. Section 27 00 00 – Communications Cable and Equipment

H. Section 28 05 20 – Security System Equipment Racks and Enclosures

I. Section 28 31 10 – Fire Alarm Annunciator

J. Section 28 46 10 – Security Control and Monitoring System

K. Section 28 46 20 – Security Network Switches

L. Section 28 46 30 –Voice Communication System

M. Section 28 46 40 – Card Access System

N. Section 28 46 50 – Duress Alarm System

O. Section 28 46 60 – Video Surveillance System

1.3 ACCEPTABLE PRE-APPROVED SEC CONTRACTORS

A. Stanley Convergent Security Solutions
14670 Cumberland Road
Noblesville, IN
(317)776-3508
Attn: Mickey Wydick
No equal

B. The pre-approval process for SEC contractors is complete. Additional prospective SEC contractors will no longer be considered.

1.4 SUBMITTALS

A. The SEC shall submit shop drawings for products in their scope of work in a composite submittal format. Equipment product submittals shall be bound in three ring binders with index tabs identified for each specification section. A complete equipment list of all components shall be located first in the binder with separate headings of each specification section. Submittals will not be deemed complete unless they contain the following components in their entirety:

1. SECTION 28 05 20 – SECURITY SYSTEM EQUIPMENT RACKS AND ENCLOSURES
   a. Rack and Enclosure Catalog Cuts
2. SECTION 28 46 10 – SECURITY CONTROL AND MONITORING SYSTEM
   a. Security System Shop Drawings
   b. Security Control and Monitoring System Catalog Cuts
   c. Uninterruptible Power Supply Calculations
3. SECTION 28 46 20 – SECURITY NETWORK SWITCHES
   a. Security Network Switch Catalog Cuts
4. SECTION 28 46 30 – VOICE COMMUNICATION SYSTEM
   a. Voice Communication System Catalog Cuts
5. SECTION 28 46 40 – CARD ACCESS SYSTEM
   a. Card Access System Catalog Cuts
6. SECTION 28 46 50 – DURESS ALARM SYSTEM
   a. Duress Alarm System Catalog Cuts
7. SECTION 28 46 60 – VIDEO SURVEILLANCE SYSTEM
   a. Video Surveillance System Catalog Cuts

1.5 SOFTWARE DEVELOPMENT REVIEW

A. Software will be reviewed and approved in three review stages.

B. PRE-REVIEW

1. Submit for review and approval color copies of graphic screens on minimum 8.5" X11" paper. The screens shall be actual copies of the proposed screen views. The Engineer and Owner will review and return with recommended changes prior to development of review one. Descriptive area nomenclature will be added to correspond to the actual descriptions the Owner intends to use for the various areas of the building.

C. REVIEW ONE

1. The first review shall take place not less than 6 months prior to the projects scheduled substantial completion date. The first review shall demonstrate the customized software of the Security Control System (SS) including; graphical representations of all areas of control, all specified integration's, control of specified devices, and graphic operational control.
2. The SEC Contractor will provide a complete, operational training/demonstration unit including monitor, computer, trackball and software during the first review. The graphic control will display the controls, on full color-graphic screens, for the subject facility to help the end users make decisions concerning the graphic integration screen layout, and device placement. The software will demonstrate all the features that are specified for the subject facility. The software will present a library of all graphical icons in full color.
3. The SEC Contractor will provide a set of full size; color drawings representing the actual screens that will be used on the control monitors. Every screen will be drawn to scale. These screen drawings will depict a minimum of the following features:
   a. Overall building layout and design of facility.
   b. Appropriate (zoomed into) area screens.
   c. The area screens will be drawn to represent the control officers view and true orientation.
4. The SEC Contractor will demonstrate the graphic control system, review the software and answer questions regarding operations. The SEC Contractor will participate in the end user review of the software.
5. All software review comments, modifications and changes shall be consolidate into a single document and returned to the SEC Contractor within 15 days of the review. The SEC Contractor will incorporate the changes in to the graphic control system for presentation at the second review.
6. The software review meeting shall be held at the Architect's office, General Contractor's office, jobsite or a location to be determined. All parties are responsible for their own travel costs and expenses to, from and for the duration of the meeting. The meeting will require time as necessary to complete, but shall not exceed 2 business days in length.

D. REVIEW TWO

1. The second review shall take place not less than 3 months prior to the projects scheduled substantial completion date. This demonstration will consist of a fully functional simulation of all software-controlled devices specified for the facility. The software shall also provide a sample of each operational alarm including audio annunciation of alarms.

2. All end user comments, modifications and directed changes from the first software review shall have been incorporated into the second software review.
3. The SEC Contractor will demonstrate the graphic control system, review software and answer end user questions regarding graphic control operations. The SEC Contractor shall participate in the second software review.
4. All software review comments, modifications and changes shall be consolidated into a single document and returned to the SEC Contractor within 15 days of the review. The SEC Contractor will incorporate the changes in to the graphic control system.
5. The SEC shall arrange for the software review meeting number 2 to be held at the SEC's manufacturing facility. This review meeting shall not exceed 8 hours in length and shall be attended by 5 staff members as selected by the Owner. It will be the responsibility of the SEC to make necessary travel arrangements including the costs of travel, food, and lodging. Expenses for additional staff members will be paid by the Owner.

1.6 OPERATIONS AND MAINTENANCE MANUALS

A. The Contractor shall provide 3 complete sets, in hard cover binders, of maintenance and operating instructions for the security electronic systems.

B. The first tab shall include the following:
1. A warranty statement signed by the integrators legal representative for the company with the warranty start date (based upon Architects signed certificate of substantial completion).
2. Procedures for obtaining warranty work with any company forms required for request of warranty work.
3. Contact information for normal and emergency service.
4. A listing of hourly rates for warranty work including normal and emergency service and the integrators designated times for each.

C. The manuals shall include a material guide that shall contain the replacement part numbers and description of all components used. System components shall be in separate index tabs for each section as described in the specifications. Each index tab shall be followed by a complete equipment list of all components for the section with a part description and the actual catalog number required for the replacement part, chassis, module or kit.

D. See General Requirements Division 01 for additional requirements.

1.7 PROJECT CLOSEOUT

A. The SEC Contractor shall provide all programming on CD disk and all source code, IP addresses and passwords for the completed systems prior to final payment. All systems are to be the property of the Owner and shall not restrict the Owner from obtaining third party service from vendors other than the original installer after the warranty period.
1. Included in the source code submittal shall be a certified letter from the software manufacturer stating that all software developed to run the system has not been developed outside the platform of the software manufacturer.

B. The SEC Contractor shall include all costs in their bid for a full-time presence on site during the first week of start-up after Owner occupancy. This requirement shall include a minimum of five 8-hour days for 1 technician. The purpose of this requirement is for trouble shooting and training that occurs during the first full week of occupancy once the security electronic system is fully exercised.

PART 2 - PRODUCTS

2.1 EQUIPMENT STANDARDS

A. A complete Security System consisting of all the individual systems as shown and specified is required. These are largely functional specifications in order to maintain competitive bidding; however, it is expected that the minimum given specification shall be strictly adhered to so as to provide a high level of quality and the design objectives. Equivalent manufacturers and products shall be in strict accordance with this specification.

B. It is the responsibility of the SEC Contractor to verify the completeness of the drawings, specifications and schedules and the suitability of devices to meet the intent of the specifications. Any additional equipment, accessories or incidentals required, whether or not specifically mentioned herein, shall be provided by the Contractor without claim for additional payment, it being understood that a complete operational system is required.

C. All materials and equipment shall be new and unused. Unless specifically approved by the Engineer, all materials and equipment in the system shall be the standard design or model ordinarily supplied as a product item by manufacturers regularly engaged in the production of such equipment. They shall be the manufacturer's latest standard designs current at the time of delivery, modified only to the extent necessary to comply with the requirements of these specifications. Where two or more units of the same class of equipment are required, such units shall be the standard products of a single manufacturer, but individual classes of compatible equipment may be the products of different manufacturers. Manufacturers shall be established in the industry so that prompt and continued service and delivery of spare parts may be assured.

D. Temperature Ratings: All indoor components in heated areas shall be capable of full operation in relative humidity up to 90% and temperatures from 35° F. to 120° F. All outdoor components shall be capable of full operation in humidities and temperatures hereinafter specified.

E. All fasteners for equipment junction boxes, control panel covers, etc. shall be security type to be compatible with those specified in Section 11 20 00 - Security Fasteners.

F. All components that comprise the various systems shall be UL listed where a UL listing exists for that component.

2.2 MAINTAINABILITY

A. Devices and equipment shall be designed and constructed to facilitate modular, unitized, component replacement to the maximum extent feasible without compromising the resistance to defeat capability of the system. The design shall incorporate solid-state components to the maximum extent feasible. Like units,

assemblies, sub-assemblies and replaceable parts shall be interchangeable as complete items.

2.3 CABLING AND TERMINATIONS

A. Cabling shall be continuous and shall not be spliced between the field-mounted device and the receiving equipment (i.e. VSS wiring shall be run from the camera to the switcher without splices, door wiring shall be run from the door to the door control panel without splices). Intermediate termination points within a wire run would be considered a wire splice. Where intermediate termination points are required, pullboxes shall include terminal strips permanently labeled with the numbering scheme per the SEC Contractors recommendations.

B. All system wiring shall be color coded with labeling and coding as submitted and approved by shop drawing. Color coding and tagging shall be maintained throughout the system at all accessible locations to the cabling.

C. All cabling exiting a building underground or in or below slabs on grade shall be UL listed for wet location in accordance with the National Electrical Code.

2.4 ELECTRICAL AND STAND-BY POWER SUPPLY REQUIREMENTS

A. Emergency power and uninterruptible emergency power will be provided by the Division 26 Electrical Contractor from a building centralized distribution system. All systems are to be on uninterruptible power supplies except the video visitation system stations. 120 volt connections are indicated on the Division 26 Electrical Drawings.

PART 3 - EXECUTION

3.1 WORK IN OTHER SECTIONS

A. The division of responsibility regarding work to be done by the Division 26 Electrical Contractor and work to be done by the Division 28 SEC Contractor shall be in accordance with the following:

B. The following work shall be the sole responsibility of the Division 28 SEC Contractor:

1. Coordination of doorframes and hardware with Division 08 and 11 in which equipment is provided that is associated with the security control system.
2. Attendance at an on-site security hardware review meeting with the Engineer, Owner and Architect.
3. Furnishing of control panels, PC touch screen controllers, relay boards, processing units, sound/intercom amplifiers, video equipment, power supplies and other major control or communication equipment associated with the SEC systems. Refer to the systems drawings which identify the various field devices, terminal cabinets, and control panels provided by the SEC Contractor.
4. Preparation of SEC shop drawings, maintenance manuals, wiring diagrams and other submittals required by the individual SEC system specification sections.
5. Tests, balancing, trouble shooting, adjustments and other similar work as may be required to insure complete operating SEC systems. Actual work shall be

performed by the equipment and manufacturer's factory authorized personnel in conjunction with the SEC Contractor.

6. All security system-training sessions required by these specifications.
7. Any and all warranty work associated with the building security system.
8. Any other work associated with the SEC systems, which due to its technical nature shall logically be performed by the SEC Contractor.

C. The following work shall be the responsibility of the Division 26 Electrical Contractor:

1. Coordination of door frames and hardware with Division 08 and 11 and the required conduit entries thereto.
2. Attendance at an on-site security hardware review meeting with the Engineer, Owner and Architect.
3. Receiving, inspecting and placement of equipment racks, termination panels and relay panels.
4. Provide raceways, pullboxes, wireways, field device electrical boxes and wiring for the various security electronics systems as specified.
5. Termination of all field devices including electric locks, door operators, door position indicator and jamb switches, keyswitches, pushbuttons, intercoms, call buttons, duress alarm devices, cameras and monitors, etc. which comprise the security control system and at the head end equipment of all systems.
6. Refer to the security systems drawings which identify the various field devices, terminal cabinets, equipment racks and control panels associated with the raceway and wiring to be provided by the Division 28 SEC Contactor for installation by the Division 26 Electrical Contractor.
    a. Refer to the system riser diagrams on the drawings and the individual system specifications, which identify the cable and conduit requirements.
    b. The Division 26 Electrical Contractor shall note that the riser diagrams are diagrammatic only and do not show specific routings of conduits. Actual routing of conduits is to be determined by the Division 16 Electrical Contractor with consideration to the actual construction conditions. Any additional pull boxes, junction boxes and conduit required to extend cabling from one location to another as dictated by the building physical structure shall be provided by the Division 26 Electrical Contractor.
    c. Refer to the electronics equipment room layouts which depict the equipment to be furnished and installed by Division 26 Electrical Contractor.
    d. Terminal cabinets and equipment racks being furnished by the SEC Contractor shall be installed by the Division 26 Electrical Contractor including the nipple conduits between adjacent panels or conduit stubs to overhead cable tray, as required. The Division 26 Electrical Contractor shall verify actual terminal panel size and nipple conduit size requirements with the SEC Contractor prior to installation.
    e. Cables shall be identified at both ends with system identifications and location identifications. Utilize a color scheme of wiring, which will identify the intended use of each conductor on systems with multiple single strand conductors (i.e. door controls). Coordinate this requirement with the SEC Contractor. Refer to Division 26 for electrical Identification requirements.

f. The Division 26 Electrical Contractor is responsible for the replacement of cables or conductors found defective when tested for connection by the SEC Contractor.

D. In coordinating the SEC work with the Division 26 Electrical Contractor, the SEC Contractor shall bear in mind that the wiring and conduit requirements called for in the construction documents are based on the requirements of a single manufacturer and may or may not be adequate for the equipment actually being furnished. The conduit and wiring indicated on the drawings or in the specifications shall be considered minimum requirements. Additional wiring, conduit, or other work required due to the use of different manufacturers or as dictated by the SEC Contractor for complete systems shall be arranged and paid for by the Division 28 SEC Contractor.

3.2 ON-SITE COORDINATION

A. The SEC Contractor's Project Manager shall make periodic site visits to review the installation by the Division 26 Electrical Contractor. Prior to start of construction, the SEC shall make arrangements and meet with the Division 26 Electrical Contractor to coordinate installation requirements for all security systems. The coordination shall include, but not limited to, the following:

1. Conduit requirements including minimum size and minimum radius bends.
2. Cabling and wire requirements including types, sizes, color-coding and labeling (per the security submittal requirements)
3. Field device box requirements including type, size and mounting heights.
4. Pull box requirements.
5. Equipment rack dimensions and shipping splits.
6. Equipment rack cable pulling clearances.
7. Equipment rack installation and entry conduit nipple sizes, quantities and locations.
8. Cable pulling requirements for equipment racks.
9. Placement of all ceiling mounted devices.
10. Termination and cable identification requirements including any color coding schemes.
11. Installation details for cameras, monitors, touch screen stations and other equipment.

B. The SEC Contractor shall visit the site once every other month until on-site to perform the start-up and installation. A report will be provided for each visit describing the work in progress, the work completed to date and the work to remain. The report shall also include a description of any changes that were discussed or directions given to the Electrical Contractor and any installation that does not meet the requirements of the SEC Contractors installation requirements. This report shall be forwarded to the construction team (Architect, General Contractor, and the Security Electronics Consultant).

3.3 FIELD DEVICE INSTALLATION

A. Field devices (intercoms, card readers, local electric key switches, etc) are shown on the drawing locations diagrammatically and shall not be used for dimensioning of final location. Devices intended for communication or control of door locations shall be final located by the Division 26 Electrical Contractor at locations most

convenient to staff for the door location. Multiple devices (i.e. intercoms and card readers) at door locations shall be mounted adjacent to one another. Door locations with card readers on both sides of the door shall not be mounted back to back on a common wall to avoid the card reader reading through the wall and indicating a false accept.

B. The SEC will provide temporary tables/workspaces as required during system cutover.

3.4 MAINTENANCE AND OTHER MANUALS

A. The SEC Contractor shall maintain a file specific to this project which shall include all security system maintenance manuals, approved shop drawings and other pertinent information. This file shall be maintained for a period of time consistent with the length of time the equipment provided is in actual service. Documents shall be of such a nature that may be reproduced to replace similar documents in possession of the Owner.

3.5 ACCEPTANCE TESTS

A. The SEC Contractor shall be responsible for conducting tests to determine systems conformance to requirements of the specifications. Tests shall be conducted in the presence of the Engineer or his authorized representative who may suspend or discontinue the tests at any time performance is considered unsatisfactory. Resumption of testing will cover untested elements and any replaced elements. The SEC Contractor shall furnish all test personnel, test instruments and equipment of the accuracy necessary to perform the test. Arrangements for testing must be made with the Engineer at least two weeks before the proposed testing date. The User's technician or other personnel shall also be present during testing.

B. The following security systems shall be individually scheduled and tested by the SEC Contractor:
   1. Section 28 46 10 - Security Control and Monitoring System
   2. Section 28 46 20 - Voice Communication System
   3. Section 28 46 30 – Card Access System
   4. Section 28 46 40 – Duress Alarm System
   5. Section 28 46 50 – Video Surveillance System

C. The SEC Contractor shall submit all test procedures and test data forms for approval in the same manner as submittals for approval. At a minimum, these test procedures shall include the following for each security system outlined for testing:
   1. A step-by-step outline of the test sequence to be followed, showing a test of every function of the equipment or system to be tested and demonstration of compliance to the contract documents.
   2. A description of the expected operation, output and test result.
   3. A data form to be used to record all quantitative results obtained during the test. The SEC Contractor shall document the test results. A certified copy of each test result shall be submitted by the SEC Contractor to the Engineer within two weeks following the completion of the test.
   4. A description of any special equipment, set-up, manpower or conditions required for the test.

D. If a hardware or software unit is modified as a result of a failure during any test or demonstration, a report shall be prepared by the SEC Contractor and delivered to the Engineer. The complete written report shall describe the nature of the failure and the corrective action taken.

E. While the system(s) are in test, major changes to the hardware or software shall not be permitted. Minor corrections of detected flaws are permitted. Major corrections shall be conducted by the Contractor during non-testing periods. When the Contractor has completed major corrections and again deems that all system operations are in compliance with the contract documents, the Contractor may request a re-test.

F. The request for a re-test shall be in writing and the re-test shall not begin any earlier than 10 days after the end of the initial test.

G. The SEC Contractor shall be required to reimburse the Owner for all cost incurred (including but not limited to Consultant costs) for all re-tests beyond the first re-test. The SEC Contractor shall responsible for all system equipment during testing.

H. The SEC Contractor shall reproduce the Security Control Point Schedule and revise to include all addendum items and User or Engineer requested changes during construction. Each point will be tested and upon satisfactory testing shall be dated and initialed by the SEC Contractor project manager.

I. The SEC Contractor shall verify the operation of all electric locks, sliding door operators, gates, door position and jamb switches. Record any malfunctions in operation or monitoring of door hardware that require mechanical adjustments. Submit the list of doors with hardware problems to the Division 11 Detention Equipment Contractor, the Architect, Owners field representatives and the SEC Engineer.

J. Upon completion of testing, the SEC Contractor shall submit written certification that all points of security have been tested and all incompletions or malfunctions listed with explanation of when and how these corrections will be complete.

K. Refer to the individual specification sections for additional testing requirements.

3.6 TRAINING

A. The SEC Contractor shall conduct group and/or individual training sessions, as required by the Owner, for the proper operation and maintenance of all security systems outlined in Section 28 46 00. The SEC Contractor shall provide a minimum 40 hours of training time during normal business hours. Training sessions shall be arranged with the Owner's representative and shall include 5 training sessions at 8 hours each or a schedule as agreed upon with the Owner.

B. The following security systems shall be individually scheduled for training by the SEC Contractor:
   1. Section 28 46 10 - Security Control and Monitoring System
   2. Section 28 46 20 - Voice Communication System
   3. Section 28 46 30 – Card Access System
   4. Section 28 46 40 – Duress Alarm System
   5. Section 28 46 50 – Video Surveillance System

C. The SEC Contractor shall record all training and instructional sessions on DVD format disk. Provide a separate disk for each system and label for the system demonstrated and turnover to the Owner.

D. SEC to provide 8 hours training time with Sedgwick County IT personnel and maintenance to review all Security System source codes and IP configurations. Source codes are to be turned over to Mike Elpers of Sedgwick County IT for management upon completion of project.

3.7 GUARANTEES

A. See Div. 00 - General Conditions.

B. During the guarantee period, the SEC Contractor shall provide for quarterly service and maintenance calls by technically qualified personnel without additional charge. Calls shall be at least eight hours at the site and shall be prearranged at least two weeks prior with the Owner. These service and maintenance calls shall be in addition to any warranty required service calls and shall commence every 3 months after the date of final acceptance by the Owner.

C. On emergency requests for service on critical security equipment during the guarantee period the SEC Contractor shall guarantee a maximum of eight-hour response time at no extra cost to the Owner, providing the calls were required due to failure or malfunction of the equipment.

D. All test adjustments or replacements shall be made in the presence of Owner's technician, or other person designated by the Owner's superintendent. Upon completion of each call a report will be provided to clearly indicate any replacements or adjustments and any evidence of tampering.

E. Contractor and equipment manufacturers shall guarantee an Electromagnetic (RFI) Compatibility Test has been conducted on all equipment installed under Contract. Any equipment found to be susceptible to RFI shall be modified or replaced for a period of one year without cost to Owner.

F. Batteries shall have a standard pro-rated one-year guarantee.

END OF SECTION

SECTION 28 46 10
SECURITY SYSTEM CONTROL AND MONITORING

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the requirements for the personal computer graphic controllers (security touch screens) and programmable logic controllers (PLC's) to be located in the building. The touch screens with their associated PC's and PLC controllers shall provide the integrated microprocessing backbone for the "Security Control System" referred to in these specifications and drawings as the Security Electronics System (SES).

B. The various control and monitoring functions to be achieved by the SES system are described in this specification. Refer to specification Section 28 06 00 - Security Control Point Schedule.

C. The programmable logic controllers along with the associated power supplies, relays and input/output interfaces, amplifiers and intercom relays are located in equipment racks in the buildings, i.e. PLC-J.

D. The security control system includes utility control panels with remote input/output PLC communication modules and relays for control of lighting, receptacle, TV power, inmate phones and water control circuits.

E. Control functions to be initiated by the SES system are described elsewhere in these specifications and on the drawings. Functions to be controlled by the SES include, but are not limited to:

1. Door Monitoring
    a. Interface between pneumatic or electric door locks, sliding doors and touch screens.
    b. Interface between intercom call-in pushbuttons and speaker output selections.
    c. Interface between Video Surveillance System intercom call-up, alarm inputs and monitors outputs.
    d. Interface between telephone control circuits and touch screens.
    e. Interface between the control of power circuits for lighting, receptacles, TV power and water solenoid valves via touch screen.
    f. Interface between duress alarms and touch screens.
    g. Other controls as described elsewhere in these documents.

F. The Contractor shall provide all labor and materials necessary to provide a dedicated security network utilizing new cable to provide a complete and working system. All equipment, cables and related hardware shall be furnished, installed, tested, labeled, and documented by the Contractor as specified.

G. Basic Electrical Requirements are applicable to all Division 28 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included in this section are the following topics:

H. The SEC Contractor as described in Section 28 46 00 shall provide all work and equipment described in this Section.

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 20 – Security System Network Switches

D. Section 28 46 30 –Voice Communication System

E. Section 28 46 40 – Card Access System

F. Section 28 46 50 – Duress Alarm System

G. Section 28 46 60 – Video Surveillance System

1.3 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification section 28 46 00 and include the following information:

1. Security System Shop Drawings. Provide shop drawings that contain the following minimum requirements:
   a. Floor plan drawings showing all equipment and device locations with proposed conduit wiring, pullbox and junction box locations.
   b. Fabrication drawings of all security system component panels and equipment as outlined for all security systems indentified under Section 28 46 00.
   c. Rack layouts of all equipment mounted in wall mounted or freestanding equipment racks.
   d. Point-to-Point wiring diagrams of circuits for all systems from the field and panel mounted devices to the associated termination points. The diagrams shall show wiring of components and all connections to be made. Terminal connections in the equipment shall be numbered to correspond to the diagrams for use in making connections. Diagrams shall be coordinated so that terminal numbering, circuit designation and equipment or device designations are the same on all drawings. Differentiate between manufacturer-installed and field-installed wiring.
   e. Camera mounting details specific to location and point by point termination drawings for all video surveillance equipment.
   f. Wiring diagrams of the actual electric locks, electric door operators, gate operators, door position indicator and jamb switches being provided for the project.
2. Manufacturers catalog specification cuts and printed descriptive literature on all security system components outlined in this specification. Each component shall be clearly identified where cut sheets have multiple equipment listings.
3. Uninterruptible power supply calculations for coordination of load with UPS supplied under Division 26.

1.4 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:

1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

1.5 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable standards are as follows:
   1. ANSI/IEEE C2 - National Electrical Safety Code
   2. NFPA 70-2005 - National Electrical Code
   3. TIA/EIA Standards 568-B, 606A
   4. IEEE 802.3 Standards for Ethernet

PART 2 - PRODUCTS

2.1 GENERAL FUNCTIONAL DESCRIPTION

A. The SES shall control and monitor all security functions of the facility. Additionally, stored programming within the PLC shall operationally perform all user control requests and alarming. Touch screens shall be integrated to the PLC's and allow the user to control, monitor and display all security system devices. Included in the system shall be robust data archiving and report generation of security system activities.

B. The SES shall be a distributed fault tolerant network. Alarm conditions, communication failure or CPU failures shall not affect other PLC's or Touch screens on the network.

C. Design of the SS shall be as an open architecture Supervisory, Control and Data Acquisition (SCADA) system. The system shall be comprised of standard off-the-shelf components manufactured for multiple industrial automation applications. Proprietary security components, systems or software shall not be acceptable.

D. All control and monitoring logic and any system management programming shall be programmed within the touch screen software program and not within any encrypted or DLL (Dynamic Link Libraries) applications. If it is determined that the SEC Contractor used these methods, the software program shall be completely redeveloped with non-proprietary programming methods at the SEC Contractors expense.

2.2 PERSONAL COMPUTER GRAPHIC CONTROLLER (TOUCH SCREEN) SOFTWARE

A. The touch screen software shall be a standard off-the-shelf SCADA system that is distributed worldwide for such automation systems. The touch screen software manufacturer shall have produced a product line of SCADA related software for at least ten years. The touch screen manufacturer must provide Internet support of its products including on-line software updates and technical support.

B. The software shall be supplied as a complete package. No additional software should be required to configure or run all the features of the system. Systems comprising a collection of software from various manufactures (other than the computer operating system) will not be considered.

C. The software shall be a 32-bit packaged product operating on the Microsoft Windows 7 platform. The software shall exhibit strong compliance with Microsoft's Windows Open Systems Architecture (WOSA) standards, such as in its use of dialog boxes and menus.

D. All configuration changes shall be capable of being made on-line, while the system is operating. Data definitions, operator displays, etc. shall be capable of being modified, added or deleted without having to interrupt the data acquisition.

E. Documentation - The system shall provide complete user documentation, including examples of how to operate the various modules within the system. The documentation must be in electronic format, HTML based with the ability to search for topics by keyword or search or specific text.

F. An on-line "help" facility, based upon Windows standard Hypertext, shall provide useful, context-sensitive information on the operation of the package.

G. Approved Manufacturers (latest XP or Windows 7.0 version for each):
1. Intellution
2. Wonderware

H. Data Handling Capabilities
1. No programming, compiling or linking shall be required to configure the system. The database tags must be configurable on-line. The process database containing the current value of the data, or tag list, shall be memory-resident and of a design that is appropriate for real-time monitoring and control functions.
2. The software shall provide pre-emptive multitasking to ensure that common Windows actions do not interfere with I/O communications, processing of data, alarming, and the integrity of the real-time and historical data. These common Windows actions include moving a window with a mouse, opening a file, accessing the hard disk, or printing a graphic display. The software shall be written fully 32-bit so that it runs native in the Windows 7 operating system. Emulation using 16-bit software code is not permitted.

I. Database Tag Configuration
1. Various input/output hardware assignments, as well as processing functions, shall be assigned to named tags or "function blocks". Multiple tags can be tied together to perform more complex functions. During the configuration process, the program shall be capable of checking the tag structures for correct linkages, appropriate names, and so on.
2. The scan-processing program shall also be capable of detecting and handling configuration errors at run-time. Any errors encountered shall generate messages to the user.
3. The user shall be able to perform tag configuration (adding, modifying, deleting, and viewing) in several ways, as follows:
    a. Directly from the graphics editor, so that tags can be configured as graphics are developed.
    b. Via an interactive spreadsheet-style database builder program that uses a fill-in-the-blank menu methodology. The database builder program shall provide the following editing functions:
        1) Cut/Copy/Paste tags
        2) Duplicate tags
        3) Generate multiple tags from a given pattern
        4) Sort tags
        5) Query tags
        6) Display tags in user-configurable formats

c. Via the importation of a CSV text file developed in another program as input for tag creation. The database builder program shall also be able to export the current tag listing for modification by the external program.

4. For methods 2 and 3 above, the development of the database tags shall be completely independent of the creation of graphics displays. Use of a programming language, such as Visual Basic, C or a C-like language, shall not be required.
5. The database has to allow for editing from a graphic editor, from within the building of a graphic operator screen, or from within a VBA script. The database editing must be able to be accessed locally or across the network. A node shall have the ability to edit a database on another node while online.

J. Database Tag Types

1. Functions shall be available in the database to support the following tag types:
   a. Analog Input
   b. Analog Output
   c. Boolean Logic, the operators must include:
      1) OR
      2) AND
      3) EQUAL
      4) NOT EQUAL
      5) NOT
      6) XOR
      7) NAND
      8) parentheses
   d. Digital Input
   e. Digital Output
   f. Text - This function reads or writes text of up to eighty (80) characters from or to a device.
   g. Timer - This tag performs a counting operation. It counts in either the up or down direction, from a pre-set value to a target value. Upon reaching the target or time-out condition, a contact may be closed. This tag also supports conditional next block processing. It shall time up to one (1) year. The timer may be started, stopped, reset or resumed based on a sensed condition or operator command.
   h. Totalizer - This tag-type maintains a floating point total for values passed to it from other database tags.

K. Tag Attributes

1. Each tag will have a tag name of up to 30 characters. The name shall be alphanumeric. All other application programs will use this tagname as their sole reference to the data element assigned.
2. For tags assigned to actual hardware points, they shall also contain fields for: Hardware device name, Hardware address, Hardware specific parameters and Signal conditioning requirements.

L. I/O Device Communications

1. The system must support communication with a variety of external input/output (I/O) devices. The devices that can be interfaced to the system must include: Programmable logic controllers, Intelligent single-loop controllers, Card access readers, Analog-to-digital converters and Remote I/O. The system must be capable of supporting up to four (4) different types of device communications drivers and up to eight (8) serial ports simultaneously.

M. Driver Configuration

1. The communications driver shall be configurable on-line. When supported by the I/O device (typically programmable controllers), block transfers (the ability to acquire multiple variables in one communications request) must be provided. The block sizes and poll times must be individually adjustable by the user. Supported block transfer times vary depending upon the I/O device, but shall be able to run as fast as the I/O device can transfer data. Alternatively, exception-based processing may be optionally selected. In some cases, the vendor may provide support for the use of unsolicited messages, if supported by the I/O device.
2. The hardware address format that the user enters at configuration time will correspond with the address format employed by the I/O hardware vendor.
3. The use of Microsoft Windows Dynamic Data Exchange (DDE) for device communications shall be supported by the vendor. However, the use of DDE shall be limited to communications with low-throughput devices, such as barcode readers and scales. It shall not be permitted for use with PLC's or other similar devices. A DLL or OPC Server will be used for PLC communication.

N. Diagnostics
1. The system will provide a diagnostic program capable of running on-line or off-line that can monitor message rates from the communication program. The diagnostic will display the number of new messages, retries, time-outs, and any occurrences of error.
2. For serial drivers, a built-in datascope shall be provided. This datascope function shall allow the user to observe the messages being sent between the computer and the I/O device.
3. Include the requirements and operational characteristics for a hardware and software solution whose purpose is to provide a “more than reasonably” secure connection between the owner provided network connection and the security network. The security network shall include the Ethernet-based PLC System communications and graphical user interface (GUI) control system communications. The Secure Gateway System (SGS) includes:
    a. Firewall Appliance(s)
    b. Remote support accessibility
4. Provide all labor, equipment, materials, and supervision to install, program, calibrate, adjust, document, and test the total system as required herein and on the drawings.
5. Provide a full integrated and seamless Secure Gateway System, offering a “more than reasonably” secure network against unauthorized access from outside the security intranet.
6. The SEC shall take on all liability for unauthorized access to the PLC Ethernet network, if this specification is not strictly adhered to.
7. The Secure Gateway System shall have the following system features and software requirements to allow for security, remote support, and future flexibility.
    a. Using a firewall appliance the SGS shall prohibit all traffic from entering the security network from the owner network, the Internet, or any other networks. This shall include prohibiting VPN connections.
    b. The SGS shall provide for security from unauthorized access to the SMS and shall prevent direct access to other parts of the Security Automation System including PLCs and Graphical User Interface Stations.
    c. When connected to the Internet for the purposes of remote support, the SGS shall allow for authorized access to the SMS via an SSL connection using 128-bit or greater encryption.
    d. The SGS shall have additional security features such intrusion detection, IP address filtering, denial of service filtering, and IP address lockout.
    e. The SGS shall provide detailed auditing and logging.
    f. The SGS hardware and software shall be upgradeable to allow for changes in protection technologies.

g. The owner shall be responsible for upgrades, training, and support after the warranty period.

8. Provide all necessary equipment for an operational SGS, consisting of, but not limited to the following. Note: Hubs, switches and routers alone shall not be acceptable.
   a. VPN / Firewall Appliance minimum requirements
      1) 8-Port Fast Ethernet Switch (at least 2 PoE)
      2) Unlimited Users
      3) 3 VLANs
      4) SSL and IPSec VPN
      5) 3DES/AES Encryption
      6) At least 150 Mbps Firewall Throughput
      7) At least 100 Mbps VPN Throughput
      8) At least 10,000 Concurrent Sessions
      9) At least 25 IPsec VPN Clients
      10) Active Standby and Redundant ISP Support
      11) Network Address Translation (NAT)
      12) Port Address Translation (PAT)
      13) RADIUS and LDAP Support
      14) Terminal and Web Based Administration
      15) FIPS 140-2 Level 2 Certification
9. Coordinate all integration with Sedgwick County LAN with Mike Elpers of County IT (second floor of Sedgwick County Historic Courthouse). All access to County LAN must be pre-approved with Mike Elpers prior to construction.

O. Stand-alone Operation
1. The software shall be capable of performing all desired functions, data acquisition, graphics, alarming, reporting, etc.

P. Graphics Capabilities
1. The graphics package must provide a means of creating and displaying color object-oriented graphic displays that will be used by the operator to monitor and control the process. Real-time values being read from the field devices shall be capable of being displayed in a variety of user-configurable formats.
2. Graphic displays shall be standard Microsoft Windows files and shall be able to be stored on the system disk, a floppy diskette, virtual (RAM) disk or file server, based on user-entered selections. There shall be no limit (other than physical disk size) to the number of displays that can be developed and accessed on-line.
3. The development and runtime graphics packages must both be multi-document architecture applications.
4. Support for displays larger than the size of the monitor shall be provided. If used, scroll bars shall be provided to allow the user to move to other areas of the display.
5. The graphic screens need to be based on objects and not individual pixels. The object graphics will consist of an image and image attributes, such as size, color, and position that will define the properties of the object. The user will use tools; menus and dialog boxes to change object properties. An object is defined as anything that can be created with drawing tools from within the package or an image imported into the package. All properties, events, and methods of the object must be exposed to the system.

Q. Graphic Creation
1. The system shall provide an interactive object-oriented editor or workspace that allows creation of graphic displays using a pointing device (for example, a mouse).
2. A facility shall be provided that quickly toggles, via a mouse click or hot-key, between the graphic building and graphic runtime modes to speed display animation verification during the development process.

3. The software must be designed with the ability to make changes to the graphics while the system is running. Shutting down the system shall not be required to make changes.
4. Browser -Once an object is created, the object needs to automatically be placed on a tree similar to the browser in Microsoft's Internet Explorer.
5. Properties Window - A properties window, exposing all properties for an object must live on the workspace. The properties window must support edit functions for any object selected. Object Duplication - Object properties must be passed when an object is copied. Copying should be able to occur from the tree browser or workspace. All properties must be passed on to the duplicated object and the name properties must automatically get changed.
6. Tile & Cascade - Graphic screens that are opened in configuration mode must support tiling and cascading. Tiling must have horizontal and vertical support and no overlapping when the graphic screens are viewed in the manor. The only limit on the number of graphic screens opened at one time is by the amount or Ram in the PC. Cascading is defined as a method to staggered pictures so they can be selected from their title bar.
7. Graphic Sizing - Size will be based on logical units; not pixels and any logical unit may be used. Graphic screen design at one resolution must be able to run at a different resolution. A full screen option as well as the ability to add sizing borders to any graphic screen must be supported. Also graphic screens must have an option to enable the screen to always be on top and a title bar enabled / disabled option.
8. Active X Support -The graphic screens must be an active X document and have the ability to have third party active X OCX, controls dropped in. The system must be capable of containing any control that is placed onto a graphic screen.
9. If a third party control crashes or misbehaves the system must be able to shut down the control while the graphic screen, system and PC remains running. Running third party controls out of the process is not a suitable requirement for the protection.
10. Touch screens to display Owner provided door/room names and numbers. SEC to coordinate with Owner.

R. Color Support
1. The graphics package shall provide support for an unlimited choice of colors with 256 colors supported at any one time. The user shall have the ability to create, save, and restore custom color palettes. Each color must have an associated so users can selected from the color the name of the color.

S. Graphic Toolbox
1. The system must provide configurable toolboxes that the graphics developer can customize as to what tools it contains and their position in the toolboxes.
2. The Toolboxes must be a Window where its shape, size and location can easily be changed with the mouse.
3. Toolboxes shall contain a method, like the ToolTips within Microsoft Word, to describe the function of each tool when the mouse cursor is positioned on a particular tool.
4. Once configured, the state of the toolboxes shall be automatically saved when the drawing session is completed. It shall be returned to that same condition when the next drawing session is started.
5. Users must have the ability to define their own buttons.

T. Graphic Animation
1. Each display must have the ability to dynamically update elements in the picture. Defining the method for dynamic update shall be determined by a point and click operation.

2. A pre-defined list of dynamic link elements that shall include the following:
    a. Data Link - Displays alphanumeric values (numeric values may be displayed in whole number/decimal or scientific notation)
    b. Time Link - Displays current time
    c. Date Link - Displays current date
    d. System Information Link - Displays diagnostic information
    e. Alarm Summary Link - Displays current alarm information
    f. Pushbutton Link - Executes a Command Language script
    g. Multi-pen Chart Link - see below
    h. OLE objects - Display a third part OLE object

U. Graphic Refresh Rate
1. The refresh rate shall be user-definable on a per object basis with the fastest rate being fifty (50) milliseconds, although it is recognized that achieving this performance is dependent upon the overall system configuration.

V. Reusing Graphic Objects
1. A method shall be provided for allowing graphics objects or groups of objects to be re-used easily. It shall allow the developer to insert native language prompts that request appropriate tag or other animation information whenever the object or grouped object is reused in another graphic display. These objects, either single or grouped, shall be intelligent, Windows wizard-like objects, so that it is possible, for example, to have a single prompt request and substitute:
    a. A single tag name into multiple dynamic properties within the object
    b. Multiple attributes (current value, high alarm limit, tag name, etc.) from a single tag into multiple dynamic properties within the object
    c. Text into the object
    d. Parameters within command language sequences
2. A library of these objects shall be included with the standard product.

W. Support Microsoft Excel and Word Documents
1. Microsoft Excel and Word documents must be able to live within a graphic screen. The documents will run within the graphic, not as an external call. The Microsoft Excel or Word toolbars will get inserted as part of the graphic toolbars for editing.

X. Documenting Graphic Displays
1. Printing of graphic displays in color and black and white shall be supported via the standard Microsoft Windows 7 Print Manager in both the graphics development and runtime environments.

Y. Operator Entry Methods
1. There shall be provided a flexible, Microsoft Windows 7 standard methodology of operator interaction with the system.

Z. Operator Action Tracking
1. The system shall print a descriptive message with a time stamp and user ID on the alarm printer or to an alarm file (if so configured) whenever any of the following events occur:
    a. Alarm acknowledgment
    b. Data entry into a tag
    c. Reloading a database file
    d. Saving a database file
    e. Restarting the system

AA. Multimedia Capability

1. Support for standard Windows 7 multimedia capabilities, including audio and video, shall be provided.

BB. Alarm Message Handling

1. The system shall be capable of detecting alarm conditions based on the states and values of the various sensed variables. The alarm conditions shall be detected even if the variables causing alarms are not currently on the display. Alarms will be used to report potentially harmful security situations requiring a response. Typically when a process value exceeds the pre-defined limits.
2. Alarm Types
   a. Analog input or alarm variables shall have the following alarm types:
      1) High
      2) Low
      3) Time rate-of-change
      4) Bad input from I/O
      5) Alarm Disable
      6) Off Scan
      7) Deadband
   b. Digital input variables shall have the following alarm types:
      1) None
      2) Change of state
      3) Open
      4) Close

CC. Alarm Priorities and Filters

1. The system shall support at least 3 alarm priorities for each alarm type: High, Medium and Low. A filtering mechanism shall be provided so that the operator can adjust the system alarm priority. The handling shall be as follows:
   a. If priority level is: Then messages will be sent to alarm destinations for tags with:
      1) Low — High, medium, and low alarm priorities
      2) Medium — High and medium alarm priorities
      3) High — High alarm priorities
2. Special alarm messages (such as I/O failure) shall be non-maskable and shall always print.
3. Messages
4. Messaging enabling and disabling must be controlled at the block level. The system must be able to send messages based on the following events.
   a. An operator
   b. A Process Database Event Occurs
   c. A system-Level event occurs
5. In addition to alarms, the following type of blocks must be able to generate messages that report to any transactions to and from the hardware:
   a. Digital Input
   b. Digital Output
   c. Digital Register
   d. Analog Output
   e. Analog Register
   f. Text

DD. System Messages

1. System messages are messages that will provide information about completed tasks and errors. System Messages will be occur on:
   a. A database finishes loading.
   b. The state of a network session changes.
   c. An I/O/ driver detects an error.

d. Start-ups.
e. Database block errors.
f. Run-time or system errors.

2. System errors will be viewed by a pop up message viewer. The viewer should allow users the following configuration:
   a. Show all entries or just new ones.
   b. Maximize on next new entry.
   c. Clear, and exit.
   d. Disable the viewer from popping up.

EE. Alarm Areas

1. In order to logically divide a process into smaller units, the system shall allow for unlimited, named individual alarm areas to be defined. These alarm areas must be definable on an individual tag level. All alarm areas must be accessible by each tag and the system must support multiple alarm areas per tag.
2. Alarm areas are used to determine which destinations receive each alarm. The method of alarm distribution over a network must be session-based in order to guarantee alarm distribution and reception. Broadcasting of alarms on the network shall not be permitted.
3. Each alarm block must be able to support an area where you can associate a graphic screen for the alarm.

FF. Alarm Destinations

1. The system shall provide a means for placing an alarm message in one or more of the following locations:
   a. Alarm summary display
   b. Alarm printer
   c. Alarm message file on disk
   d. Alarm history window (first-in, first-out scrolling window on the display)
2. The system shall allow either COM1, COM2, LPT1 or LPT2 to be the alarm printer. The use of multiple alarm printers shall be supported to allow routing of alarms from different alarm areas to different printers.
3. Alarm messages shall be independently user-configurable as to what information is provided and its sequence within the message. The following shall be available choices:
   a. Time of the alarm
   b. Name of the tag causing the alarm
   c. Alarm condition code
   d. Engineering units value when the alarm occurred
   e. Descriptor text assigned to the tag
   f. Engineering units of the tag
   g. Directly to a relational database
4. Also, the user shall be able to specify the length of the alarm queue for each destination.

GG. Time Stamping

1. A time stamp must be included with every alarm or message. This time stamp will indicate the time and date that the alarm or message was generated. Time stamping must be supported from the local computer time, OPC server time, or process hardware's clock.

HH. Alarm Notification and Acknowledgment

1. When a new alarm condition is detected, an alarm message will be generated.
2. If the alarm condition code text for the block is on the current display, then the text will flash until the alarm is acknowledged. Alarm acknowledgment will be

performed from the operator's keyboard or with the mouse and shall require no more than one keystroke or mouse click.

3. The system must be capable of "freezing" the highest alarm status value on the display until acknowledgment is made. Once acknowledgment is made, the system will display the current alarm status text.
4. The software shall provide built-in capabilities to support the following:
    a. Remote acknowledgment. This shall allow, for example, a button to be depressed by the operator, which closes a digital tag and acknowledges one or more alarm conditions, as configured by the user.
    b. Alarm suspension. This shall allow the user to specify digital tags, that when closed, cause alarms not to be generated for one or more alarm conditions. This is useful, for example, during the start-up phase of a project to avoid nuisance alarms.
    c. Re-alarm time. This shall allow the system to re-generate an alarm after a user-configurable amount of time, should the alarm condition still exist.
    d. Delay time. This shall allow the user to specify a period of time for which an alarm condition must remain before an alarm is generated. This is useful, for example, if certain actions may cause a temporary, but acceptable, fluctuation beyond alarm limits and the generation of alarms is not desired.
    e. Close contact on alarm. This shall allow the user to specify digital tags that become closed when certain alarm conditions occur. These contacts can then be used to take actions, such as sounding a horn or initiating a sequence of instructions. Also, the user can specify the conditions under which these digital tags are re-opened, including the following:
        1) When the alarm is acknowledged
        2) When the alarm is cleared
        3) When the alarm is acknowledged and cleared
        4) Never (it must be re-opened by a different function)
5. Messages shall be able to be designated as “events-only”. These will be distributed to alarm destinations, but shall not require acknowledgment.

II. Alarm Summary Display

1. The system must offer an alarm summary display as a pre-defined, customizable, OCX, dynamic link within the graphics package. This alarm summary display must show a list of the pending alarms in the system. As new alarms are detected, entries are made to the display list. As the alarm conditions clear, the entries are removed from the list.
2. In addition to being able to configure the placement of the information (tag name, current value, descriptor, time of alarm, and alarm status), the user shall be able to specify the color codes to be used to indicate the various alarm conditions.
3. Alarms can be acknowledged from the alarm summary display either individually (by clicking on an alarm acknowledgment field) or for all alarms in the queue.
4. The alarm summary display must provide sorting and filtering capabilities. The user shall be able to filter on node name, alarm area(s), alarm status and alarm priority. The user must be able to sort on time, tag, alarm area, alarm priority and alarm status. The user must be able to display field or fields about the alarm block in a column format and do complex filtering.

JJ. Archiving and Reporting

1. The system must provide a facility for automatically collecting, storing and recalling data. Recalled data will be made available to a report generation program and to user-written programs.

KK. Data Access

1. The system shall provide an open architecture that allows interaction with other programs. It must provide a mechanism for other programs to access individual

data elements and fields (such as the high alarm limit of an analog input) within data elements in real time. File transfer mechanics is not acceptable; the access must be direct to the memory-resident database.

2. The following shall be supported:
    a. ODBC. The system shall support Open Database Connectivity (ODBC) for sharing data from its database to any other ODBC complaint database through SQL queries, via an ODBC dynamic-link library (DLL) driver. At a minimum the database shall support communication to Microsoft Access, SQL Server, and Oracle.
    b. OLE for Process Control (OPC). The system shall be both an OPC clients for communicating to any OPC complaint server as well as an OPC server to serve data to any OPC complaint client.
    c. Visual Basic for Applications (VBA). The system must have VBA embedded as part of the development environment. VBA support will be used for pre built scripts & custom scripts. It must also support search and replace and the ability to copy all forms modules and scripts from one object to the next.
    d. OCX or Active X. The system must support the ability to have any third party OCX (Active X control) placed into its container. All third party controls must have the right to behave like any object created by the system. Also the system must contain any bad or misbehaving OCX or Active X control and be able to shutdown the control without shutting down the graphic picture, system, or Node.
    e. DDE. The system must support Microsoft standard Dynamic Data Exchange (DDE) Server and Client functionality to share data with other DDE-aware applications.

LL. On-Line Tutorial

1. An interactive on-line tutorial shall be provided as part of the software to teach the basic operations of the system, including graphics and tag development. The tutorial shall demonstrate the configuration operations using interactive on-screen instructions.

2.3 PERSONAL COMPUTER GRAPHIC CONTROLLER (TOUCH SCREEN) HARDWARE

A. Each touch screen shall be comprised of a personal computer system. Provide a tower type floor mounted case. The touch screen shall also be simultaneously mouse driven. The hardware configuration shall be in accordance to the touch screen software manufacturer recommendations, the performance requirements and minimum hardware requirements outlined herein:

1. Hard disk Storage: Sized to accommodate touch screen software including: runtime and development programming, project files, operating system, utility files and database configuration files. Additionally, the disk shall be sized to allow for one gigabyte (1Gb) of database archive storage.
2. Hard disk back-up capabilities: Removable media, CD's sized to back-up the complete hard disk with no more than three media (i.e. 3 CD's). User accessible back-up and retrieval software.
3. Compact Disk Drive: Speed as required by touch screen software manufacturer.
4. PLC interface hardware: Hardware capable of interfacing touch screen to corresponding PLC using copper media and operating at a minimum data communications speed of 56K bits/sec.
5. Random Access Memory (RAM): Sufficient memory to ensure instant access and display of user interface screens, 2 gigabytes minimum. (It shall take less than 1 second to display a screen and update all screen parameters when switching between views).

6. Communication Ports: As necessary to support all functions of the touch screen. Printing shall be via a parallel port. Minimum of one parallel and two serial ports.
7. Graphics microprocessor: SVGA and a 100% IBM-compatible, 24-bit, Pixel resolution to be 1024X768 with a minimum of 256 colors displayed concurrently.
8. Sound card: High-resolution sound card to provide stereo sound annunciation to external speakers.
9. External speakers.
10. Desktop microphone with push-to-talk switch.
11. Monitor: Touch screens shall be of the analog capacitive technology with 1024 touch points resolution. Linearity shall be less than +/- 1% error with a drift offset of no worse than +/- .5% anywhere on the screen. Mean Time Between Failures (MTBF per MIL-HANDBOOK-217D) for the controller shall be greater than 176,000 hours and a touch life in any one location of 20 million touches. Connection from the touch screen to the PC computer shall be bi-directional asynchronous RS-232C with data rates selectable from 110-19,200 baud. The touch screen software driver shall be Windows 95 (or greater) compliant with the ability to exchange data with other Windows applications using the Dynamic Data Exchange (DDE) interface protocol. The touch screen driver shall allow the touch area to activate upon release from the touch screen. Provide a minimum 18" (viewable) high resolution color flat panel LCD monitor, dot pitch shall be 0.28" maximum. Provide 24" wide screen flat screen touch screens monitors were required. See detail A/SE5.1. All touch screens shall be enabled for activation upon release of touch. Program touch screens with 3 viewports of live video call up as shown on riser diagram A/SE5.4.
12. Point Device: The system shall include a heavy-duty optical mouse such that the operator may choose between operation through the touch screen or the mouse. Both shall be active at all times.
13. Keyboard

2.4 TOUCH SCREEN ADDRESSING

A. General
1. Provide a touch screen sized to accommodate the interfaced PLC I/O points and functional operations required at each of the following locations:

Floor	**Room Location**	**Designation**	**TOUCH SCREEN Address**
1	Work Release	Master Control	TS-WA
1	Work Release	Master Control	TS-WB

2.5 USER INTERFACE TOUCH SCREEN DEVELOPMENT

A. Each touch screen shall incorporate custom user interface screens specific to this project that allow the user to control, monitor and display all PLC I/O functions. Individual touch screens shall display graphic floor plans of the individual touch screens coverage area. Alarms, events or intercom calls shall be graphically displayed on the designated touch screens in accordance with these specifications.

B. User friendly intuitive icons shall be developed for all devices that require control and/or monitoring by the user. Door control unlock functions shall require a two-step operation by the user for normal door unlock. This two-step operation shall consist of a function selection and then a selection of the location. The function to lock a door shall be a single step operation.

C. An icon halo box shall be used which will appear when the operator's mouse is in the icon field of detection. This is required to assist the operator in verifying selection of the correct icon.

D. The ergonomic design of the user screens shall be such that daily operations shall be accomplished via the touch screen or pointing device only. Use of the touch screen keyboard will not be necessary except for administration functions. Once the system is setup, programmed and fully tested, the keyboards shall be removed and turned over to the Owner.

E. An exception-based strategy shall be applied to the development of all touch screens. Colors utilized in the screen development shall be neutral gray in nature. Alarms, events and intercom calls shall be exceptions to the screen and shall be highlighted to call the operator's attention. Color schemes for categories of activities (exceptions) shall be developed (i.e. intercoms or signal calls green, door alarms red, etc.). Color schemes may be used for other areas of the screens not involved with the operation of floor plan functions (i.e. intercom incoming call tally, global functions described in this specification).

2.6 DUAL OPERATOR INTERFACE SCREENS

A. Touch screens in Master Control are to be fully independently operational and include the functions as described in this specification. Functions for intercom and camera call-up shall operate independently. Response to intercom calls and video call-up at one touch screen shall not affect the operation of the other touch screen.

B. Reponses to alarms shall be capable of being silenced and reset at either station. Changes in status of alarms (doors, duress alarms, etc.) shall appear on both touch screens such that both stations are aware of the change in status.

2.7 CONTROL TRANSFER

A. The Master Control touch screens shall incorporate all touch screens in the facility including control and status of all devices and voice communications regardless of which touch screen has primary control of these devices. The Security Control Point Schedule includes only the primary control locations. When the primary control touch screen location is active the device icons at the Master Control touch screens will appear with the device icons as sunken or recessed. Screens, which are not part of the Master Control normal screen coverage area (i.e. Housing Control), shall be password protected to allow monitoring of other touch screens to prevent inadvertent control. Control shall be possible by entry of a valid password.

B. Shutdown of all touch screens at locations other than Master Control either by operator input or activation of hardwired duress alarm at the touch screen designated area shall automatically transfer control of these areas to Master Control. When this occurs, these device icons shall appear the same as the device icons associated with the Master Control touch screens. Master Control shall reinitiate control of the affected touch screen after the duress alarm has been reset.

C. The Master Control Touch screens shall have the graphic floor plan orientation to match the operator's physical operating location in the building.

2.8 SPECIFIC GRAPHIC REPRESENTATIONS

A. With all systems as described in this specification and in the function in their normal state, the graphic floor plans and icon functions shall be neutral gray. Each touch

screen floor plan layouts shall be graphically represented to depict the operator's actual position on the floor plan. Each screen will also include descriptive nomenclature to describe areas of the floor plans such as "BOOKING", " VEHICLE SALLYPORT", KITCHEN", etc. to assist the operator in orienting themselves to the physical location.

B. For multi-story housing dayrooms provide an arrow on the screens to take you from lower level to upper level and from upper level to lower level.

C. The following minimum graphic screens are suggested:
1. Booking
2. Housing

D. Screens will be reviewed for layout in software pre-review process specified elsewhere in this specification.

2.9 USER INTERFACE SCREENS – GLOBAL FUNCTIONS

A. The following functions shall be incorporated into each touch screen:

B. CLOCK
1. Each touch screen shall display the time of day in one corner of the screen. The clock shall have the ability to display 12 or 24-hour format, user selectable throughout the systems utilities function.

C. Door Maintenance
1. Selecting this icon shall display the door cycle dialog box, which shall contain a list of all doors in the maintenance group. Each door will have its cycle operation counted and stored. A door cycle alarm will be generated when a door reaches its cycle limit. The door must be reset in the maintenance program at this time, or it will continue to alarm at each door cycle. The door cycle quantity alarm shall be user selectable. The SS Contractor shall set the initial quantity based upon the recommendation of the actual locks to be installed. The following functions shall be provided:
2. Open the list by selecting the down arrow in the door field, and then select a door in the list.
3. Select (read) to display the current cycle count. Select reset to reset the count cycle to 0.
4. Select (all door report) to print a report of all doors and their cycle counts. Select (reset all) to reset all door cycle counts to 0.

D. Alarm Summary Screen
1. Each touch screen shall have the ability of switching to a touch screen specific alarm summary screen. All alarms specific to that touch screen shall be displayed on the alarm summary screen. Alarms shall be color coded according to the state and priority of the alarm including; acknowledged alarms, unacknowledged alarms and alarms that have returned to normal state but not yet cleared from the screen. Each alarm received shall; display an alarm message (text string up to 131 characters long) fully describing the nature of the alarm and its specific location, time/date of the alarm and sound an audible alarm. Acknowledgment of an alarm will require the user to individually select the displayed alarm with the touch screen pointing device (i.e. group acknowledgement will not be allowed).
2. Alarms shall be prioritized according to the following schedule:

Priority	Display Alarm Summary	Operator Acknowledge Required to Silence	Operator Acknowledge Required to Clear	Print to Printer	Log to Database
1	X	X	X	X	X
2	X	X			X
3	X				X
4	X				X

3. Priority 1 Alarms – touch screen shutdown, Door Alarms (Forced Entry), Duress Alarm, Breech of Interlock
4. Priority 2 Alarms – PLC alarms and touch screen communication alarms
5. Priority 3 Alarms – Intercom or Signal Calls
6. Priority 4 Alarms – All other PLC I/O and touch screen activities and operations
7. The system shall be configured such that the operator is notified of an alarm no matter what display (screen) they are currently viewing. Notification shall be by audible tone, a flashing icon (process symbol) and message on the alarm summary screen and alarm status bar.
8. Alarms shall be printed to the history logging computer printer. The format of the alarm printout shall be configurable and correspond to the alarm summary screen messages.

E. Digitized Voice

1. The system shall incorporate digitized voice software and hardware to integrate with the graphic controller so that all operator actions, system warnings, system emergencies, and other pertinent information are announced to the operator through an audio card operating on the PC's bus.
2. Executing the voice sound shall not prevent the operator from performing any screen functions, and the operator will not have to wait for the sound to be completed before proceeding to other screen functions.
3. Within a system utilities screen the operator shall be able to choose a female voice or a male voice. The operator shall also be able to choose full voice interaction or partial voice interaction. Full voice interaction uses voice during all screen operations while partial voice interaction uses beeps and chimes during normal operations and uses voice for all announcements and alarm conditions.
4. The owner shall approve the vocabulary during the system design and software review phase and shall be allowed to have the complete vocabulary modified once during this time. Digital voice must also operate on the help screens. When an icon is touched on the help screen, the voice explains the operation of the icon.

F. PASSWORDS

1. The graphic controller shall have 1000 passwords and 5 different levels of security. The owner shall have an administration password that enables the owner the ability to alter passwords and password levels. The administration password shall be able to be changed by the owner.

2.10 FUNCTION DESCRIPTIONS

A. The graphic controllers are only an operator interface to the system. No control logic is allowed in the graphic computer. All control logic is to be through the PLC. Graphic controllers must be able to control the same points and be able to be integrated into the same control system.

B. FUNCTIONS - The graphic controllers consist of a combination of annunciate and function icons. The icons are:

1. DOOR CONTROL
2. DOOR CONTROL INDICATORS
3. GROUP UNLOCK
4. HOLD OPEN
5. STAFF ACCESS
6. INTERLOCKED DOORS
7. ISOLATE DOOR
8. COMMUNICATE
9. INTERCOM TOUR
10. SOUND MONITORING
11. ISOLATE INTERCOM
12. SIGNAL CALL
13. VIDEO
14. VIDEO GROUP
15. VIDEO PLAYBACK
16. HIDDEN FUNCTION
17. ON/OFF CONTROL
18. STATUS AND NAVIGATION MAP
19. CELL TAGGING
20. PENDING LIST
21. ACTIVE STATION TEXT
22. CALL ANSWER
23. CALL ANSWER AND ZOOM
24. ZOOM ACTIVE
25. CALL DISCONNECT
26. EMERGENCY GROUP RELEASE
27. EMERGENCY EVACUATION
28. LOSS OF POWER
29. CONTROLLER DISABLE
30. SILENCE
31. RESET
32. LOG ON/OFF
33. DOOR NUMBER DISPLAY
34. ELEVATOR CONTROL

C. Function icons shall operate as follows:

1. DOOR CONTROL
    a. Selecting the DOOR icon without a menu active will result in the act of locking (electric or pneumatic locks) or closing (electrically or pneumatically operated sliding) the door. UNLOCK, HOLD OPEN, STOP and ISOLATE are menu functions that act with two keystrokes to make the door operate. Two-keystroke operation for unlocking a door is critical so that doors cannot accidentally be unlocked. The keystrokes required for opening an overhead, sliding, or swinging door is the same. The officer will first select the UNLOCK icon in the DOOR CONTROL menu area which will cause the digital voice message to announce "unlock"; then within 3 seconds, select the DOOR icon on the touch screen at the location of the door and the digital voice message will announce the actual name of the door as defined by the owner. The door will become unlocked. Other doors may be commanded to become unlocked by selecting other DOOR icons within 3 seconds of the first. After 3 seconds of no icon DOOR selections, or when another menu function is selected, or the RESET icon is selected, the UNLOCK (or other command)

cancels. After the door has unlocked for a specified amount of time, it will then relock automatically.

b. To stop the motion of a sliding, or overhead, door, the officer will select the STOP icon and the DOOR location icon.

c. Logicshall be included in the PLC program so that sliding doors must be secured for a sufficient amount of time or the activation to open the sliding door has sufficient amount of time to avoid a switch bounce problem. This time duration must have the ability to be adjusted through software.

2. DOOR CONTROL INDICATORS

a. Each door control door control icon shall have a graphical representation of the door. If the door is a swing type door it shall depict the door swing open or closed. If it is a sliding type door it shall depict the door as secure, mid-travel or fully open.

b. There shall be separate and distinct graphic representations using a combination of icon movements and/or color changes according to the following conditions:

1) Door is closed and secured (normally gray/gray).

2) Door is powered open but the lock status switch, bolt position switch and the door position switch are still indicating the door is secure (red/white).

3) Door is shown open when the door is powered and opened (red/red).

4) Door is shown open when the door is not powered but is open (gray/red).

5) Door is violated or manually mechanically opened (flashing red/flashing red)

c. Detailed explanations shall be included in the shop drawing submittal for review of this function.

d. The SMS shall record all group unlock, relock or alarm activities.

3. GROUP UNLOCK

a. There will be an individual GROUP UNLOCK icon for each housing pod or sub-pod. Group unlock may apply to swing doors or sliding doors. Selecting the GROUP UNLOCK icon is a two-icon operation for unlocking (opening) a group of doors. Two-icon function is critical so that groups of doors cannot accidentally be unlocked. The officer will first select the UNLOCK icon in the DOOR CONTROL menu area which will cause the digital voice message to announce "unlock"; then within 3 seconds, select the GROUP UNLOCK icon on the graphic at the location of the pod or sub-pod, the digital voice message will announce the actual name of the pod or sub-pod as defined by the owner. The doors will unlock all cells in the associated pod or sub-pod, three at a time at three seconds intervals. Other pods or sub-pods may be commanded to be group unlocked by selecting other GROUP UNLOCK icons within 3 seconds of the previous. After 3 seconds of no icon GROUP UNLOCK selections, or when another menu function is selected, or the RESET icon is selected, the GROUP UNLOCK cancels. After the doors have unlocked for a specified amount of time, it will then relock automatically.

b. Individual doors can be bypassed for this function by using the ISOLATE DOOR FUNCTION described below.

c. Logic shall be included in the PLC program so that sliding doors must be secured for a sufficient amount of time or the activation to open the sliding door has sufficient amount of time to avoid a switch bounce problem. This time duration must have the ability to be adjusted through software.

d. The SMS shall record all group unlock activities.

4. HOLD OPEN

a. This feature will unlock the door and keep it electrically unlocked until the officer selects the DOOR icon only which will relock the door and return it to

normal operation. Other doors can be selected for HOLD OPEN within 3 seconds of the first selection. After 3 seconds of no selections the HOLD OPEN command cancels. When in the HOLD OPEN function an “X” will be placed though the icon to alert the operator of this condition.

b. The SMS shall record all doors in the hold open position and return to normal.

5. STAFF ACCESS
   a. Doors with electrically operated keyswitches or card readers for local staff control in addition to being controlled by the touch screen can be enabled or disabled at the scheduled touch screen. The key switch or card reader is enabled when the operator first selects STAFF ACCESS and then selects the door icon within 3 seconds. Other doors can be selected for staff access within 3 seconds of the first selection. After 3 seconds of no selections the staff access command cancels. In the enabled condition, for swing doors, the key switch is turned to the right, momentarily; the associated door unlocks and then relocks after 3 seconds. For sliding doors, the key switch is turned left (to close) right (to open). When the door location is selected for staff access, the door icon will have a graphic representation of a key symbol through it. Violations shall continue to be annunciated as described in door control indicators above. Repeating the process will reverse the condition.
   b. The SMS shall record all doors in the staff access positions and return to normal.
6. INTERLOCKED DOORS
   a. Where two or more doors with electric hardware form a secure sally port or where interlocks between hardware sets are indicated on the plans or in the security control point schedule, the operation of the door hardware shall be as follows:
   b. When a door location is selected that is included in an interlock group, a yellow halo shall appear around the door icons for all doors included in the interlock group of the touch screen at Master Control. Attempting to unlock a door when another door in the group is open shall cause a digital voice to announce, "ACCESS Denied. Door is interlocked."
   c. The security system shall allow only one door of an interlock group to be in the non-secured condition at any given time unless the interlock override function is activated. The operator must select the press to override icon prior to unlocking a door to defeat the interlock.
   d. When the interlock override icon is pressed, a yellow pop up message box shall be displayed with a written warning and the digital voice shall warn the operator of the danger associated with over-ride of the interlocks. The warning message must play in its entirety before the first level confirmation icon is displayed.
   e. A second and larger yellow interlock override warning box shall then appear with a written warning. A second digital voice warning must play in its entirety before the second level confirmation icon is displayed. Only after the second confirmation is made shall the interlock indications be removed from the screen.
   f. Once any door icon is pressed, the interlock override function shall cancel. If no door icons are pressed within 10 seconds of the second confirmation, the interlock override function shall cancel. In addition, the function can be canceled at any time by pressing the ‘CANCEL’ ICON.
   g. The SMS shall record all openings, unlocking, relockings, secure actions, door position, lock status, violations, violation silencing, violation resetting, interlock violations, and resetting of interlock violations.
7. ISOLATE DOOR
   a. Electrically controlled doors, or doors that are also controlled by field mounted local card readers, key switches or pushbuttons can be isolated

such that they cannot be opened from the local card reader, key switch or pushbutton. The officer first selects ISOLATE DOOR and then selects the DOOR icon depicting the door to isolate. Other doors may be commanded to become isolated by selecting other DOOR icon within 3 seconds of the first. After 3 seconds of no isolate door selections, the ISOLATE command cancels. Repeating the process on an isolated door reverses the condition and returns the door to normal.

b. The DOOR icon will have a yellow "X" marked through it indicating that the door cannot be unlocked by the local device. Violations and the door status representation will still be shown.
c. Attempting to unlock an isolated door will cause the digital voice to announce, "Function not allowed. Door is isolated."
d. The SMS shall record all isolated door positions and return to normal.

8. COMMUNICATE
   a. Establishing audio communications from the touch screen is accomplished by selecting the COMMUNICATIONS icon at the location of the intercom station. There shall be a COMMUNICATIONS icon for each intercom station. The audio is now connected to the remote station and the COMMUNICATIONS icon is green. The video of camera/s viewing that area are now shown on the INTERCOM CALL-UP MONITOR(S), and audio is established; while the camera symbols that cover that intercom station are now green. If no camera is viewing that location, audio will be connected without video. Repeating the operation will cancel the call. Connecting to another station will automatically cancel the previous connection. Canceling the intercom call or connecting to another station shall return the camera icon gray. Selecting the SELECT TO TALK on the desktop microphone allows the officer to talk to the station.
   b. The COMMUNICATIONS icon is used to show the state of the intercom call. If the call icon, located on the intercom station, is selected, and the call has not been acknowledged, the COMMUNICATIONS icon flashes green and the digital voice will sound a digitized telephone ring until the call is connected or the SILENCE icon is selected.
   c. If the call has been answered, the COMMUNICATIONS icon will be solid green, and all cameras called up to follow the intercom will be solid green. If another call is incoming while the first is being serviced, that COMMUNICATIONS icon flashes and the digital voice will softly annunciate an incoming call.
   d. The SMS shall record all intercom call activity, including when the call was placed and answered.
9. INTERCOM TOUR
   a. This feature allows the officer at each housing pod control station to automatically listen to selected cell intercoms sequentially within the units of their control. There shall be an INTERCOM TOUR area with icons for START, PAUSE and STOP for each housing pod. Selecting the START icon shall open the audio communications individually for each selected cell sequentially and allow the officer to listen to the area. The icon shall turn yellow when selected and will start the auto tour. The selected cell intercom icons of each shall change status to green indicating which intercom is open. Housing unit and floor levels will be automatically displayed when the sequence changes from housing unit to housing unit and from lower to upper levels. Pressing the PAUSE icon shall stop the tour at the location in process to allow the officer to listen for an extended period of time. Pressing the PAUSE icon a second time will return the auto tour to sequence to where it left off. When the PAUSE icon is selected it shall turn from gray to blue. To turn this function off, the STOP icon is selected which turns off the auto-tour and turns the START icon to gray. When the STOP icon is selected the

sequence returns to it's starting location when START is reselected. Alarm and normal intercom call functions will be superceded by this function and automatically pause the auto tour.

b. The UTILITY CONTROL section of the screen shall allow the officer to select the time duration for sequence from 3 to 10 seconds per cell intercom.

10. SOUND MONITORING
    a. This feature allows the officer to listen to a designated area. There shall be a SOUND MONITORING icon for each area as scheduled. Selecting the SOUND MONITORING icon shall open the audio communications to the selected area and allow the officer to listen to the area. The icon shall turn yellow when selected. Pressing the push-to talk button on the desktop microphone allows the officer to talk to the selected area. To turn this function off, the icon is selected which turns off the audio communication and turns the icon to gray.
11. ISOLATE INTERCOM
    a. This feature allows the officer to shut off an intercom station so no audible tone associated with an incoming call is received at the touch screen. This is to be used for disruptive inmates who are continually pushing their buttons on the intercom. The officer first selects ISOLATE INTERCOM and then selects the intercom location. Other intercoms may be selected within 3 seconds of the first. After 3 seconds of no isolate intercom selections, the ISOLATE INTERCOM function cancels. Repeating the process on an isolated intercom reverses the condition and returns the intercom to normal.
    b. An isolated intercom station is still accessible by the officer via the COMMUNICATE features. An ISOLATED intercom still visually annunciates, only the incoming audible is defeated.
    c. The intercom shall have a yellow "X" marked through it indicating that the intercom station has been isolated.
    d. The SMS shall record all isolate intercom operations and return to normal.
12. SIGNAL CALL
    a. This function is used to draw the operator attention to a door location where no intercom or video exists. Each location will be graphically displayed by an icon depicting a program bell. When not active the icon is gray. When the call button is depressed at the remote location, the icon shall flash green and an audible bell tone shall sound at the touch screen station. The icon can be silenced by selecting SILENCE function, which will turn the icon solid green. The icon is returned to normal by RESET function.
13. VIDEO
    a. Each camera icon shall include the camera number as designated on the drawings or as required by the termination equipment. PTZ camera icons shall include either a set of arrows indicating the cameras ability to pan or include the designation "PTZ" to distinguish controllable cameras differently than fixed cameras.
    b. This function is independent of the communications icon function and requires a separate matrix output.
    c. Establishing video communications from the control panel is accomplished by selecting the VIDEO icon. Selecting the VIDEO icon on the graphic panel at the location of the camera will cause the icon to be solid blue and the camera image to be displayed on a VIDEO SELECTION MONITOR. Selecting that VIDEO icon again will cancel the video and return the icon to its gray state. Selecting a different VIDEO icon will cause that camera to be active and will cancel any others cameras that are active.
    d. Operation of PTZ cameras is accomplished through the desktop video controller.
    e. The SMS shall record all video selection activities.
14. VIDEO GROUP

a. There shall be a vertical column of icons along the left side of the touch screens for PC-MA and PC-MB to allow the operator to call up several cameras associated with specific areas outside of their normal control area of the building. These icons shall be permanent to the screen. See the Camera Schedule and VSS Configuration Diagram on the drawings.
b. Selecting the icon for the designated area will cause the matrix switcher to select those cameras as outputs to the designated monitor via multiplexer output. The icon shall turn yellow and remain until deselected.

15. VIDEO PLAYBACK
    a. There shall be an icon for quick video playback of selected cameras. Selecting the playback icon first and then the camera icon will playback the last 10-15 seconds of the camera view on the pod camera up monitor or quadrant designated for camera call-up and video playback. The icon shall change color with a “P” either adjacent or over the top of the icon. The time duration for playback shall be adjusted through a utility icon that gives access to a time section that can be adjusted with a maximum limit. Selecting the camera icon will deactivate the playback.
16. HIDDEN FUNCTION
    a. Selecting the HIDDEN FUNCTIONS icon will take the operator to a separate screen for on/off control of lighting circuits, television and receptacle power circuits, water solenoid valves and inmate telephone circuits. This function reduces the quantity of icons being displayed for purposes of communication and door control. The HIDDEN FUNCTION will cancel and the normal operating screen will appear in three seconds if no on/off control functions are performed. The HIDDEN FUNCTION will cancel if an alarm condition is initiated from a filed device, automatically returning to the normal operating screen.
17. ON/OFF CONTROL - LIGHTS, TV POWER, RECEPTACLE POWER, WATER, INMATE TELEPHONE ON/OFF CONTROL FUNCTIONS
    a. These controls appear on the HIDDEN FUNCTION screen described above. When HIDDEN FUNCTION is selected, icons will be displayed representing lighting, TV power, receptacle power, water solenoid valves and inmate telephone in the areas as scheduled and indicated on the drawings. These icons when in the off position are gray. Selecting these icons will toggle between off and on. Icons will appear yellow in the on position.
18. STATUS AND NAVIGATION MAP
    a. A portion of each screen (approximately 4" wide by 2" high without obstructing the floor plan) shall be allocated and used for the purpose of making screen movement tasks easy for the operator. This window shall contain the whole building and be located on every screen. All screens shall be accessible with one touch of the site plan such that any screen can be accessed from any other screen with just one touch of a screen's outlined area on the site plan. Each control screen shall be graphically outlined on the depicted map.
    b. Selecting an outlined area of the site plan shall cause the touch screen controller to go directly to the screen that controls the touched area. The area on the site plan that represents the current screen shall be highlighted in white so that the operator knows exactly what screen is active in relation to the whole facility. A distinctive audible sound shall annunciate when this action is performed. The other areas shall be gray unless pending calls or alarms are active.
    c. When calls are pending from areas other than the current screen, and these calls are defined to be answered at a particular touch screen station, then the area of the call shall flash green and gray on the site plan. If both an alarm and a pending call are active at the same time in an area, then the respective area shall flash red and green.

d. When alarms are active from areas other than the current screen, then the area of the alarm shall flash red and gray on the site plan. If both an alarm and a pending call are active at the same time in an area, then the respective area shall flash red and green.
e. Touch screens are allowed access to only certain screens. The site plan shall display the current user's available screens in contrast with the whole site plan. Selecting the inaccessible parts of the site plan shall result in a message and the digital voice stating "Access not allowed. Enter a password for access."

19. CELL TAGGING
    a. Provide means of tagging individual cells with “Post It” type notes to allow correctional officers with the ability to indicate “on the fly” the particular needs associated with each individual holding cell.
    b. Messages to be typed from keyboard located at each officer workstation.
    c. Messages shall be customized for “on the fly” editing, and shall appear on the touch screen for immediate recognition.
    d. Provide the ability to turn notes on and off from an icon selection on the touch screen.
20. PENDING LIST
    a. The list of 5 incoming pending calls designated for the particular touch screen station shall show the owner-assigned text names for the oldest 5 pending calls that have not been answered and in the order that they were initiated. As a call is answered, it shall be removed from the list and the list shall be automatically updated with any new incoming calls. Calls can be answered out of sequence if desired by the operator.
21. ACTIVE STATION TEXT
    a. Any call that is active shall be displayed in this area with the owner-assigned text name for the station that is active.
22. CALL ANSWER
    a. Each time this icon is selected, the active station will automatically cancel and the first station on the pending list will automatically connect. If there are no pending calls, this button shall not be visible on the screen.
23. CALL ANSWER AND ZOOM
    a. Each time this icon is selected, the active station will automatically cancel and the first station on the pending list will automatically connect. Also the touch screen station will automatically go to the screen where the answered intercom station is located. If there are no pending calls, this button shall not be visible on the screen.
24. ZOOM ACTIVE
    a. When this icon is selected, the touch screen will automatically go to the screen where the answered intercom station is located. It there is no active call; this button shall not be visible on the screen.
25. CALL DISCONNECT
    a. When this icon is selected, the active intercom call is disconnected. Associated cameras on call-up monitors are turned off and their icons return to gray.
26. EMERGENCY GROUP RELEASE
    a. This function shall only be available from Master Control touch screens.
    b. Each housing unit will include an icon identified as EMERGENCY GROUP RELEASE. When selected, a warning by the digitized voice explains the consequence of proceeding with the emergency group release function. Simultaneously, a pop-up window shall appear. Within this window will be a text prompt asking the operator if they wish to proceed with this function. Also located within this window shall be two icons, one small prompt box with the text “YES” and one large prompt box with the text “NO”. Clicking the “NO” icon shall cause the verification window to be removed from the screen

and the system will return to normal operating mode. Selecting the “YES” icon shall cause the pop-up verification window to be removed from the screen, the emergency group release icon shall flash orange and all cells in the associated area shall unlock/open three at a time at three seconds intervals.

c. The SMS shall record all emergency release activities.

27. EMERGENCY EVACUATION
    a. This function shall only be available from Master Control touch screens.
    b. Located on the touch screens are icons labeled as EMERGENCY EVACUATION. When selected, a warning by the digital voice explains the consequences of proceeding with the evacuation and offers directions for the operator. Simultaneously, a pop-up window shall appear. Within this window will be a text prompt asking the operator if they wish to proceed with this function. Also located within this window shall be two icons, one small prompt box with the text “YES” and one large prompt box with the text “NO”. Clicking the “NO” icon shall cause the verification window to be removed from the screen and the system will return to normal operating mode. Selecting the “YES” icon shall cause the pop-up verification window to be removed from the screen and another screen shall appear with the text “UNLOCKING OF DOORS WILL BE A ONE STEP OPERATION”. Also located within this window shall be two icons, one with the text “YES” and one with the text “NO”. Clicking the “NO” icon shall cause the verification window to be removed from the screen and the system will return to normal operating mode. Selecting the “YES” icon shall cause the pop-up verification window to be removed from the screen.
    c. The operator can page through all screens to see which doors are to be evacuated. Each door that is a designated evacuation door will be marked with the letter "E" in red on the door icon and will be able to be unlocked by a single icon selection of the door.
    d. The assignment of doors to be included in the evacuation procedures will be identified during software development review.
    e. The background around the EMERGENCY EVACUATION icon shall flash and the digital voice shall continuously announce "Emergency Evacuation." The emergency evacuation mode is returned to normal or stopped when the emergency evacuation icon is selected a second time which will silence the digital voice and return the icon to normal state.
    f. The SMS shall record all emergency release activities.
28. LOSS OF POWER
    a. When the loss of AC power is detected and the PLC reverts to UPS or emergency power, an indication labeled EMERGENCY POWER shall flash and the alarm shall sound.
29. CONTROLLER DISABLE
    a. Selecting this icon will immediately disable all functions of this panel. The SS shall record to disk all panel disable activities. The panel shall be reinitiated at Master Control PC-MA.
30. SILENCE
    a. Selecting this icon will silence the audible annunciators used to indicate a violated door, staff station request, or any other alarm. The SS shall record to disk all panel silence activities.
31. RESET
    a. Selecting this icon will cancel any door violation condition and/or any active menu. RESET does not affect communications calls. The SS shall record to disk all panel-reset activities.
32. LOG ON/OFF
    a. Activation of a touch screen location shall occur using a card reader and valid card. The cards shall be the same cards as assigned to operators for

the Card Access System described in Section 17463 – Card Access System. Attempting to log on by presenting a card to a touch screen that is already active shall result in a voice announcement “TOUCH SCREEN ACTIVE”.

b. Presenting a valid card for a non-active touch screen shall cause a graphic representation of a standard PC keyboard to appear on top of the graphically displayed area. The user is to key in their login password. The login identification of the user logged into the touch screen shall be displayed next to the digital clock on the touch screen. In addition, all touch screens shall display the users logged on at each touch screen in the SS. Establishing, changing and maintaining user logins and passwords are functions performed by users identified as supervisors.

c. To log off the operator selects their login identification on the screen which creates a pop-up window with a “YES” or “NO” icon. Selecting the YES icon logs the operator off the system.

d. Each log on attempt (valid or not valid) and log off shall be recorded to the SMS.

33. DOOR NUMBER DISPLAY

a. The touch screens shall have the ability to display either the architectural assigned door numbers or the Owner’s assigned door numbers. This function will be accessible from the SYSTEM UTILITIES FUNCTION. The selection of door number preference will be controlled globally so that all touch screens display the selected preference.

34. ELEVATOR CONTROL

a. Elevator Operation:

1) Master Control: Can switch both elevator control modes: Master Control Override Mode and Normal Override Mode.

b. Touch screen Annunciation Functions:

1) Screen graphics will appear muted when current status is inactive.
2) Cab position: A real-time animation display of cab floor position.
3) Cab direction: The cab position display indicates the active directional movement of the cab.
4) Cab Door Position: The cab position display indicates the active position of the cab doors.
5) Up/Down Hall Call: The cab position display indicates the active status of the up and the down hall call pushbuttons located in the elevator lobby on each floor.
6) Car Call: Individual icons for each floor indicate a car call request from the cab by “steady” indication.
7) Operation Mode: The mode indicating icon toggles between “Master Control Override,” and “Normal Override” annunciation.
8) Master Control Override Mode: Indication that the elevator is operating in “Master Control Override” mode as described by the sequence below.
9) Normal Override Mode: Indication that the elevator technicians have overridden control and placed the cab in normal operation.

c. Touch Screen Control Functions

1) Direct Floor Control: When operating in “Master Control Override Mode” the direct floor control icons and cab door control icons become active. In this mode, all hall call and cab call signals are reset and future hall and cab calls are not acknowledged by the system. Master Control officer has the ability to send the elevator cab directly to any floor by touching the direct floor control icons and is directly responsible for controlling the opening and closing of the cab doors.

2) Mode Control: Provides switching between the “Master Control Override Mode,” and Normal Override Mode operational sequences.
3) Door Open/Close: When operating in “Master Control Override Mode” the door open and door close icons become active for direct control by Master Control.
4) Intercom: Intercom station control icon for audible communication to the cab.
   a) Master Control intercoms shall be installed inside all elevator main car operating panels, activated by the “push to call” button.
   b) Master Control intercoms shall be installed in walls of all elevator vestibules, next to each elevator hall button fixture.
5) Integrate elevator control with automatic camera call-up.
   a) Hall intercom should call video to quadrant Q1 on elevator touch screen.
   b) Cab intercom should call video to quadrant Q2 on elevator touch screen.
   c) Integrate quadrant Q3 on elevator touch screen with floor of debarkation.
   d) See video configuration diagram as shown on the Drawings.

d. “Master Control Override Mode” Elevator Operational Sequence
1) Pressing the “Mode Control” icon changes the operational sequence of the Master Control touch screen from “Normal Override” to “Master Control Override Mode”.
2) Upon activation of the “Master Control Override Mode” all registered hall call and car call signals are cleared and future hall and car calls will not be registered.
3) Direct floor control icons and door open/close icons on Master Control touch screen become BOLD and active.
4) Pressing a direct floor control icon immediately dispatches the elevator cab to the selected floor, the door open and close positions are controlled directly by the Master Control officer.
5) The real-time cab position display on the Master Control touch screen control console monitors the status of floor location, directional movement and door position.

e. “Normal Override mode” Elevator Operation Sequence
1) When the authorized elevator technicians are working on an elevator they enter the cab and activate the “Normal Override” key switch on the car panel placing the car in normal operation. The key switch on the car operating panel shall override all three Master Control Operational Modes.
2) All control functions are removed from the Master Control officer and the “Normal Override Mode: icon is illuminated.
3) All elevator monitoring functions remain active in Master Control.
4) “Normal Override Mode” operation remains until the elevator technician deactivates this function by the cab panel key switch.

f. Elevator Fire Service
1) Fire Alarm Elevator Recall and Fire Service shall override all elevator operation.

2.11 TOUCH SCREEN SECURITY MANAGEMENT

A. The touch screen software shall provide a user-based security system. Each touch screen must allow for the creation of users with certain rights and/or privileges. These rights must include the ability to run any combination or all of the applications in the touch screen system. The ability to allow or disallow user access to control devices or switch into selective screens shall be supported.

B. Groups of users, such as Operators, Supervisors and Administrators shall be created and granted rights. All users assigned to a group obtain the rights of the group, although they are still tracked by the system by their individual ID. Individual members of a group may also be assigned additional rights.

C. As part of the touch screen development, the proposed security structure shall be presented to the Owner for review and approval. Security structuring and format for each individual touch screen shall be presented. The Owner reserves the right to change security levels during the touch screen development stage.

1. The touch screen security management system must support a tie to Windows 7 security.
2. When user-based security is enabled, an audit trail will be generated in the system that will tag every operator action with a user identification (ID) and shall be stored to the touch screen database.
3. Systems that use a level-based security methodology shall not be acceptable.
4. The following functions must be supported within the security application:
    a. Enable/Disable user-based security
    b. Define users, passwords and login names
    c. Define groups to which users may belong
    d. Define security path(s)
    e. Define user and/or group rights/privileges
    f. Define security area names
    g. Define system auto-start user
5. The ability to “lock” an operator or other user into the runtime graphics environment shall be provided. Specifically, disabling any combination of the following shall be supported:
    a. Starting other applications.
    b. Switching to other applications that may be running.
    c. Exiting from the system.
    d. Restarting the computer using <Ctrl><Alt><Delete>.
    e. Opening unauthorized graphic screens.
    f. Closing the current graphic screens.
    g. Using the system menu.
    h. Switching to the configuration environment.
    i. Accessing the system tree.
6. The system shall allow for a login timeout setting for each user account. This variable setting will logout an operator when the time interval expires.
7. The system shall support manual login and logout as well as automatic login.

2.12 SYSTEM UTILITIES

A. Each touch screen shall have the ability of switching to a touch screen specific utility screen. This screen will be limited to operators with a valid supervisory log-in and password. This screen shall be menu driven and will consist of, but not be limited to, the following functions:

1. Touch Screen Security Management
2. Date and Time configuration.
3. Pointing Device configuration

4. Printer Test
5. Intercom Auto Tour time sequence
6. Door number display
7. Additionally, from this screen system administrators with a valid administrator log-in and password will be allowed access to the touch screen Development Software.

2.13 ARCHIVING

A. Each individual touch screen shall automatically collect, store and recall all PLC and touch screen I/O data. The status of each I/O point (local PLC and touch screen) shall be stored to the database every time the I/O point changes state. All entries to the database shall include a user intuitive descriptor, time/date stamp and state. The state of the I/O status shall be descriptive (i.e. door Open/Closed) not simply on/off. When applicable, the entries to the database shall include the user identification (i.e. alarm acknowledged by user 'name').

B. Data stored within the database shall be stored in Windows-compatible files for exportation and report generation. Separate database files shall be capable of being copied (exported) to the removal storage media provided with the touch screen. The system must support third part applications for ODBC queries. Recalled data from the database shall be made available to a report generation program and to user-written programs.

C. Separate database files shall be created each day, one continuous database will not be acceptable.

D. A mechanism for on-line maintenance and automatic purging of files must also be provided.

2.14 HISTORY LOGGING COMPUTER (HLC)

A. The History Logging Computer shall log security commands made within the correctional facility as they happen. Provide facility administrators the ability to monitor and review all operational aspects of the Security Automation System and its operations. The intent is that by recording all actions of the system, it shall provide owners with greater liability protection and accountability.

B. The HLC shall have the following software requirements to allow for seamless control and future flexibility.

C. Data Logging
1. The integrator shall provide a SMS system with a single point for logging, recording, report generation and backup. Distributed databases are not acceptable.
2. The SMS shall be capable of processing 100,000 transactions per day (minimum).
3. The SMS shall be capable of communication to multiple PLCs over Ethernet.

D. Audio Logging
1. The SMS shall have the ability to record the audio conversations from each control stations simultaneously to the SMS hard disk as a WAV or MP3.
2. Each audio recording shall include; Time/Date, Touch screen user, Touch screen station, and field intercom station.
3. The transaction log shall provide an automated link for every intercom call for the officer to recall the audio clip. The SMS shall replay the audio file without preventing or degrading any data logging function or live audio clips from being recorded.

4. Provide Play, Stop, Pause, Fast Forward and Reverse functions for audio playback.
5. Provide hard disk space on the SMS sufficient to record telephone quality (8 bit, 11 kHz minimum) for 500 channel-hours (one channel per Touch screen) of audio online. Provide the ability to save an audio file to separate media for long term storage.
6. Provide audio playback ability to the subnet for Administration Viewing & Retrieval PCs as defined in Section 17462.
7. Provide the necessary hardware for every intercom to be recorded with this system.

E. Archiving & System Management
1. The database shall be able to contain up to 5 million transactions prior to the need to archive data.
2. Automatic archives shall be user configurable for frequencies of daily, weekly, monthly, quarterly, semi-annual, or yearly. In addition, the user shall be able to select the day of the week or month to create the archives.
3. When performing an archive, the user shall be able to select to archive only, archive and delete the archived events from the database, or delete only. The user shall also have the option to perform the same action on audio files.
4. Archived events shall be viewable in an identical format as the original SMS, using the standard SMS application. The sorting, searching, and reporting generating functionality shall be identical to the standard SMS application as well.
5. The system shall notify the user when the transaction register reaches a user definable limit to allow for data archiving. If the database reaches the user defined limit, an automatic archive will be performed so that current logging will not be affected.
6. The user shall have the ability to set an expiration date for all archives stored on the SMS computer. Archives that have reached their expiration dates shall be deleted automatically to create additional hard drive space.
7. The system shall notify the user when the hard drive reaches a user definable percentage of free hard drive space. If the hard drive reaches the user defined limit, the oldest audio and archives shall be deleted automatically so that current logging will not be affected.
8. The user shall have the ability to perform a full database backup.

F. System Features
1. The History Logging Computer (HLC) performs several valuable functions, but is not an essential component of any operational control system. It shall be configured as follows:
    a. The HLC is an IBM type personal computer connected via Ethernet to the PLC controller.
    b. The HLC receives alarm and transactions from the PLC within 500 milliseconds of the occurrence. The HLC shall record Time/Date, Device, Device Action, and user the name of the user performing the action for all transactions and alarms. Transactions & Alarms include, but are not limited to:
        1) The HLC shall record to disk all door openings, closings, unlocking, relockings, secure actions, door position, lock status, violations, violation silencing, violation resetting, interlock violations, and resetting of interlock violations.
        2) ISOLATED doors are reported by the SMS during daily reports. Changing the state of ISOLATED doors is recorded to disk by the SMS.

3) Doors with STAFF ACCESS granted are reported by the SMS during daily reports. Changing the state of STAFF ACCESS doors is recorded to disk by the SMS.
4) All interlock override activities.
5) The SMS records any intercom call activity, including when the call was placed and answered.
6) Every intercom pushbutton press.
7) All communications ISOLATE activities.
8) All touch screen disable activities.
9) All touch screen silence activities.
10) All touch screen reset activities.
11) All duress activities.
12) All video activities.
13) All utilities activities.
14) All PLC system faults.
15) All Touch screen login/logout activities.

c. All transactions (action codes), alarms and status are continually outputted from the PLC. The PLC shall be able to service this data management activity and continually control all other devices specified elsewhere in this specification without any additional delay in system throughput.
d. The HLC will provide preventative maintenance functions by continually counting operations of all devices.

2. The HLC operates in a MICROSOFT WINDOWS environment and provides the following features:
   a. If multiple Touch screen stations and/or Graphic control panels are provided, the SMS shall be capable of recording all events of all stations and panels.
   b. Transactions sent to screen, disk or printer are time and date stamped. Line by line printing shall contain line numbers, such that physical cutting and pasting is impossible. Any printed reports shall also contain this protection.
   c. Provide a Microsoft compliant database for storage of system transactions as well as BLOB's (binary large objects like audio and video files).
   d. Provide password protection to prevent modifications to the database system.
   e. All reports/searches shall take less than five minutes to generate for the most intensive retrieval.
   f. The database shall be able to contain up to 5 million transactions prior to the need to archive data. The system shall allow the user to perform backups in 600MB sections to facilitate backup to CD-RW. Archived data shall be viewable, in an identical format as the original SMS, from the CD without the need to install any additional software. All data on the CD shall be able to be sorted, searched, reports generated and printed directly from the CD.
   g. The system shall notify the user when the transaction register is 85% of the maximum to allow for data archival. If the database reaches it maximum, logging will not be effected. Instead, an automated deletion of the oldest 600MB of data will be purged to allow new data to be saved.
   h. The database reports shall include the option to export the data to a comma separated file (.csv) to be used by owner provided software.
3. The HLC will include a complete comprehensive relational database report utility, accessible via a pull down menu. All reports are titled, time and data stamped, and contain anti-cut and paste line numbering. It shall be possible to easily select reports to show the history of any device or group of devices between specified times and dates.
4. The DAILY REPORT will print to screen or paper the list of states during the day by event occurrence of all controlled devices, alarms, isolations and conditions. The report is programmable to the desires of the owner. Consultation with the owner during the training period will determine the content of this report.

5. The HISTORICAL REPORT allows the operator to select any and all transaction types, alarms, time changes and any other system functions as described in the specifications, and is done by defining a start date and time and a stop date and time. The computer will search any applicable matching occurrences and print either to the screen or printer as a report; thus allowing searching for:
6. Specific time periods.
    a. Specific transaction types.
    b. Specific locations.
    c. Any combination of the above.
    d. Specific keywords.
7. HLC Client:
    a. Provide client software which will be provided for the owner to install on up to 5 owner supplied PCs to allow the viewing of all transactions, generate reports, playback audio, and allow search capabilities. Connection to SMS will be over a dedicated Ethernet connection from the SMS computer to the owner supplied PCs on the Security Automation System secure intranet.
    b. Provide the ability for clients to backup/archive the event log database, to view data from any archived database, including CD-ROMs, and export reports to a .csv format.
    c. Provide ability to add, delete, and modify users for the touch screen login validation.
    d. Provide the ability to assign users access to specific touch screen stations.
    e. Provide the ability for users to login via a touch screen proximity reader or user name and password.
    f. Provide a fully integrated, Windows based, on-line help system.
    g. Provide a fully integrated Web based client which shall allow access to the HLC database, through password protection, via a commercially available browser application. The Web based client shall allow the viewing of all transactions, generate all reports, playback transaction audio MP3 files, allow searches and printing to local printers.
8. Hardware configuration
9. The following minimum equipment is required:
    a. Intel I3 based computer running at 1GHZ clock speed.
    b. Operator interface shall be controlled by Microsoft Windows 7 with lockout of all other functions except by special keystroke and password access.
    c. Enhanced 101 key keyboard.
    d. 19" LCD flat screen monitor.
    e. Optical wheel mouse.
    f. 16GB of RAM.
    g. 250 Gigabyte, 7200rpm hard drive or greater to provide specified storage.
    h. 600DPI HP Laserjet printer.
    i. Serial ports as required.
    j. 8x4x32 CD-RW drive.
    k. Two 100BaseT NICs.

G. The HLC shall provide continuous audio recording of all intercoms and speakers in the security electronics system.

2.15 PROGRAMMABLE LOGIC CONTROLLERS (PLC'S)

A. ACCEPTABLE MANUFACTURERS
1. Allen-Bradley
2. General Electric/Fanuc
3. Omron

B. GENERAL

1. High reliability, integration of functionality, software flexibility and ease of maintenance shall be the primary criteria for PLC system selection. To achieve this end the following specification shall be strictly adhered to.
2. Each PLC shall be a standard industrial grade product designed for high reliability. The PLC shall be manufactured by a company that has produced a product line of compatible PLC's for at least fifteen years
3. The PLC manufacturer must guarantee the availability of spare parts for a period of 10 years.
4. The PLC's shall be configured as direct digital controllers without dependency on a central processing unit or central software package. Loss of communications to and form the communications network shall in no way affect the operation of the local graphic controller associated with its local PLC. Failure or loss of any PLC shall not affect the operation of any other PLC.
5. The PLC CPUs shall be software based utilizing RAM and EEPROM such that any future changes in alarm reporting, interlock schedules or control functions will be accomplished by a software change only not requiring any rewiring or addition of equipment. Software flexibility is mandatory, discrete circuit door control is not acceptable.
6. PLC output boards shall not be allowed to directly drive electric locks, sliding doors or any other function with either a surge current or continuous duty current or more than 500 milli-amps. Output boards shall drive relays as described herein.
7. Each monitored swing door shall have two separate and distinct monitored points. Monitoring a swing door with a single secure/unsecure point is unacceptable. Swing doors with electric locks shall be monitored for separate points for lock bolt status and for door position status.
8. Initiation of unlocking/locking, opening/closing or doors shall have maximum time duration of 1 second, from time of initiation from the control panel or graphic controller to movement of the door device. This time duration shall appear to be imperceptible by the operator.
9. All PLC to PLC communication shall utilize a fiber optic backbone.
10. All PLC's shall communicate with the Security Control System (SS) and touch screen. All PLC operations and I/O states shall be continuously communicated to the associated touch screen.
11. Provide programmable logic controllers (PLC's) sized to accommodate the inputs/outputs and functional operations required at each of the following locations:

Floor	Room Location	Designation	PLC Address
1	Work Release	Security Electronics	PLC-J

C. PLC CENTRAL PROCESSING UNIT (CPU)

1. The PLC CPU program shall functionally execute all system control commands and operations. The CPU program shall be specific to the local PLC control area and shall be stored in battery-backed static RAM memory. Additionally, the CPU program shall be stored in EEPROM located on the CPU. The CPU shall automatically execute the EEPROM program if a RAM program fault is detected by the CPU. RAM and EEPROM shall be sized sufficiently to meet the functional requirements of this security system plus 25% memory for future expansion.
2. CPU RAM and EEPROM shall be programmable through the use of a portable personal computer. CPU program execution shall not be halted during uploads to the personal computer.
3. PLC CPU scan times shall be as follows: Program Scan Time/Kword shall be less than 0.6ms and I/O scan time per rack shall be less than 11ms at 57.6K bit/s.

4. Each PLC CPU shall have a minimum of four independent communication ports capable of supporting the following functions: one Ethernet communication to other system PLC's (minimum speed of 50K bit/s), two inter-PLC communication ports (i.e. DH+, MODBUS+ - minimum speed of 50K bit/s) to the security management system graphic controller and diagnostic/development terminal and one remote I/O port for communication to remote I/O racks. The PLC shall be capable of communicating via a Peer-to-Peer communication strategy with other system CPUs (PLC and PC). No PLC shall be considered a “CENTRAL” PLC (CPU) to the system.
5. The PLC CPU shall be hardware lockable in the “RUN” mode. Selection of PLC CPU “PROGRAM” or “NONE – RUN” modes shall be via a mechanical key at the CPU locations.
6. The PLC CPU programming software shall be capable of supporting ladder-logic, function block, SFC and structured-text programming. Advanced instruction sets including file handling, sequencer, diagnostic, shift register, immediate I/O and program control instructions shall also be supported.
7. For diagnostic purposes, the CPU program shall be capable of Forced Values for all I/O.
8. The PLC CPU shall provide real-time health and status information to the user. Diagnostics must run during system start-up and during system run-time. The CPU program shall be designed to provide fault response to a fault before the security system goes down.

D. INPUT/OUTPUT MODULES AND RACKS
1. Each PLC shall be equipped with a sufficient quantity of input and output (I/O) modules and associated back-plane racks to provide the described functionality. Provide at least 10% spares of each type of module at each PLC location for future expansion (i.e. If 16 input modules and 16 output modules are provided for a PLC location, two additional input and output modules shall be provided in the I/O rack).
2. PLC input cards shall be optically isolated and capable of accepting input signal voltages of 24 volts AC or DC. Each input point of the card shall have a corresponding LED indicator, which illuminates when the associated input is at zero voltage potential.
3. PLC output cards shall be capable of source switching all designated control devices (multiple voltage or application output cards will not be acceptable). Each output point of the card shall have a corresponding LED indicator, which illuminates when the associated output is energized.
4. All I/O modules (including spares) shall be rack mounted in the corresponding PLC I/O back-plane rack. Each rack shall be supplied with a rack mounted power supply capable of supplying all I/O modules and the PLC CPU. Spare capacity shall be designed into the power supply to account for future I/O modules outlined herein.
5. Provide chassis mounted I/O modules.

E. REMOTE INPUT/OUTPUT (I/O) CONTROLLERS
1. Provide remote I/O controllers for utility control panels RC/A and RC/B as indicated on the drawings.
2. Remote I/O controllers shall provide sufficient points for the required controls and monitoring at the remote location. The remote I/O controllers shall include the required interface modules for the communication bus at the PLC. Power for the remote I/O shall be derived from the power supply feeding the PLC equipment racks. The communications bus to PLC’s shall utilize copper or fiber optic data transmission.
3. The remote I/O controllers shall be mounted in a NEMA 1 hinged cover termination box. The I/O module shall directly interface to the lighting control panel interface module as a dry contact for control of power circuits. The lighting control panel

shall control power circuits from the interface module via relays and power supplies in their panel.

F. PLC EQUIPMENT RACKS
1. All PLC equipment shall be mounted in a freestanding rack. PLC I/O racks, power supplies, I/O modules, CPUs and interface relays shall be rigidly mounted and labeled within the rack. All equipment mounted within the rack shall be easily accessible for service and/or replacement.
2. All wiring within the rack shall be placed in covered wire molding wire ways. AC and DC wiring shall be separated by independent wire ways. Wire ways shall be sized for 40% wire fill. A minimum space of two inches shall be maintained between all cabinet mounted equipment and wire ways.
3. The rack shall also be fan cooled and ventilated in accordance to the PLC manufacturers cooling requirements.
4. All rack mounted equipment shall be labeled with a rigid, two color laminated, plastic nameplate identifying the piece of equipment. The labels shall be permanently affixed to the rack with screws or rivets.
5. Refer to Section 28 05 00 – Security System Racks and Enclosures.

2.16 MECHANICAL RELAYS

A. Light duty relays and similar devices shall have dust covers which protect against fouling by dust or other material which may adversely affect their normal operation. All mechanical plug-in relays shall be equal to Potter-Brumfield KUP Series with contact rated 10 amps. All relays shall be of the plug-in type with LED status indication and individual fuses. Relays for control of motor-operated locks and sliding doors shall be horsepower rated for the device it controls.

B. Relays shall be DIN-rail mounted for easy replacement and shall be individually fused with LED indicator showing the status of each relay. In the group, gang or emergency release modes of operation the relays shall be controlled by the local PLC such that no more than three doors are operated at a time on a single circuit and the doors shall be released or closed in groups of size in three second intervals; this function is to be automatic and controlled via the PLC.
1. Relays for control of motor-operated locks and sliding doors shall be horsepower rated for the device it controls.
2. Relays for intercom control shall be hermetically sealed designed for audio circuits
3. Relays interfaced to control AC power circuits shall be rated 20 ampere at 120 or 277 VAC and MOV protected to prevent induction currents.
    a. Provide Panasonic WR61613K-84 series relays as required for utility control. Rockwell Automation 700-HG push-pull power relays unacceptable.
    b. Size relay for 277V or 120V circuits.
    c. All utility control relays to be equipped with local on/off status indicators/switches
    d. Maintain separation of 24V low voltage control and 277/120V line voltage power wiring as required by NEC.
4. Relays for telephone control circuits shall be four-pole. Coordinate requirements with Owner's telephone system vendor. These relays shall be located in the PLC equipment racks.
5. Provide relays required for complete remote elevator control. Interface with existing elevator control relays. Provide remote relay cabinets in elevator equipment rooms as shown on the Drawings.
6. Use of electronic control boards for door control unacceptable.

2.17 DOOR CONTROL POWER SUPPLIES

A. Provide regulated DC power supplies for the control and operation of electro-magnetic locks, electric strikes, detention pneumatic and/or motor-operated and electric solenoid locks. Power supplies shall be 120 volt AC input and 24 volt DC output, Class II, with a maximum +/- 10% voltage fluctuation.

B. Coordinate and verify all lock power requirements with Division 08 and 11 for the actual hardware manufacturer being supplied. Power supplies shall be sized as recommended by the manufacturer with 10% spare capacity at each door control power supply location.

C. Where the functional requirements dictate that one control function (emergency group release) is to open multiple doors, the opening (as for electrically operated doors) or unlocking (as for electrically operated door locks) of doors shall be sequentially staggered at a maximum of three at a time so as to minimize the power supply required for the electric locks or operators.

2.18 MISCELLANEOUS POWER SUPPLIES

A. Miscellaneous plug-in power supplies shall be strapped to their receptacle with tie-wraps or secured to the receptacle cover plate if the power supply includes a mounting tab with screw. This is to prevent the power supply from loosening over time or from being accidentally disconnected.

2.19 LOCAL PUSHBUTTON DOOR CONTROL

A. Selected doors with local pushbutton door control as indicated on the Drawings and scheduled will be interfaced to the PLC controller as a valid input. This input will unlock the door and prevent an alarm condition to occur at the monitoring touch screen/s.
   1. Wall mounted: Basis of Design – Quam CIB2
   2. Desk Mounted: Basis of Design – SDC 15-2

2.20 SECURITY NETWORK COMPONENTS

A. LAN Switch
   1. Redundant LAN switches for the security network shall be provided with layer 3 switches to provide separation between the various networks operational in the Rock County Juvenile Detention Center.
   2. LAN switches shall be powered by 24VDC. Any variation in the power requirements shall be the responsibility of this contractor to coordinate with other trades.
   3. Provide a network that shall include redundant connections between the PLC system, video graphic interfaces, audio system, camera system, and other integration system CPU.
   4. This network shall be a high speed, fault tolerant, self healing, Ethernet industrial communication network. It shall be a 1 gigabit star topology network using fiber optic media as required and be in compliance with IEEE 802.3. All switches shall be managed.
   5. Network switches shall be capable of providing wireless access points as add on modules.
   6. Door Control and Data Network
      a. Manufacturer/Series:
         1) Phoenix Contact MMS Series
         2) Hewlett Packard 1910 Series
         3) Hirschmann Mice Series

4) Cisco 3750 Series

7. Video Surveillance Network
   a. Manufacturer/Series:
      1) Cisco 3750 Series (with redundant power supplies)
      2) Hewlett Packard 1910 Series

B. Media Converters
1. Media converters for network switches will be provided by the SEC. The media converters shall be installed and made operational by this contractor

C. Fiber Optic Patch Cables
1. The Fiber Optic patch cables shall be 50/125-micron multi-mode fiber utilizing tight buffer construction. The fiber optic patch cables shall be minimum 1.5 meters in length.
2. Fiber Optic jumpers shall incorporate Ceramic or Metallic tipped LC type connectors on one end to match the fiber optic cabling installed under section 27 00 00. Connectors to owner provided equipment shall be as required to connect to equipment. Connectors used in fiber optic patch cables shall meet requirements set forth in the Fiber Optic section of section 27 00 00.
3. Channels in duplex patch cables shall be of equal length.
4. Cables shall be aqua in color.
5. The contractor shall provide thirty 30 Fiber optic Patch Cables (duplex).

D. Cat 6 Patch Cables
1. The copper patch cables provided under this contract shall be four pair, category 6 rated cables. Each cable shall be performance tested for conformance to the TIA/EIA-568-B standards for category 6.
2. Cables shall be terminated in RJ45 plugs on each end of the cable.
3. These cables shall be minimum 2 meters in length. The length of these cables shall be sufficient to route the cable through existing cable managers.
4. Cables shall be green in color.
5. Contractor shall supply sufficient cat 6 patch cables to connect all cameras, Network video recorders, storage devices and miscellaneous equipment to provide a complete and working system.

2.21 POE POWER INJECTOR

A. MANUFACTURERS:
1. Veracity
2. Pelco
3. Or Approved Equal

B. MINIMUM REQUIREMENTS:
1. The device shall meet the demanding data rate and power requirements of the attached IP cameras with high-quality streaming video capabilities.
2. The device shall meet the IEEE 802.3af standard for detection, connection, disconnection, and fault protection.
3. The device shall be compatible with 10/100Base-T systems and systems up to 1000 Mbps.

2.22 API INTEGRATION

A. An application programming interface (API) is provided for the security network. The API provides programmatic access to the network-connected components managed by the security network.

B. Communication between the security network takes place through the TCP/IP networking protocol. The API is invoked by POSTing an HTTP message to the web server on the network controller.

C. The API supports commands for:

1. Pinging the security network system to determine its health, and retrieving the current version of the API from the server.

2. Adding, modifying, deleting, and retrieving time specifications and time specification groups.

    a. Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.

    b. Requesting events from the Activity Log that occurred within a specified time period. These events are returned from the API in the CSV Export report format.

2.23 LIGHTNING PROTECTION

A. All communications and data equipment control, sensor and data cabling shall be protected against induced surges. Surge protection shall be provided on all circuit ends that meet the IEEE 772 surge withstand capability test and the electrical transient tests an established in UL 365-1985. Fuses shall not be used for surge protection.

B. All power connections including low voltage power supplies and direct-wired or plug-in 120VAC power connections for all system components shall be equipped with lightning suppression devices. All communications, data and power lightning devices shall be bonded to building grounding system in accordance with Article 250 of the National Electrical Code.

C. Provide a dedicated no. 6 AWG insulated ground copper conductor from building ground to all security equipment rooms, security control equipment panels and control rooms. Connect all lightning protection devices and security equipment non-current carrying metal parts to grounding conductor in accordance with Article 250 of the National Electrical Code.

2.24 SPARE PARTS

A. To facilitate ease of maintenance provide spare equipment as follows:
1. One fully loaded touch screen computer, such that this unit can be used as a spare backup processor at any of the touch screen stations by selection of a pre-loaded software program. The software shall include icons of each touch screen station on this project, which when selected will auto-boot the program for the touch screen location.
2. One Input cards of each type used on the project.
3. One Output cards of each type used on the project.
4. Fabricated relay board, if used, one of each kind.
5. Provide 5 spare relays of each type used on the project.

6. Two PLC CPU fuses for each CPU supplied.
7. Ten I/O fuses.
8. One spare LAN network switch.
9. One spare video surveillance system network switch.
10. One spare door control system network switch.

B. Provide spare equipment in static resistant packaging and turn over to the Owner's designated maintenance supervisor. A signed document demonstrating proof of receipt shall be delivered to the Architect prior to receiving final retainage.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified.

B. Refer to Project Drawings that indicate the equipment location within each building.

C. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

D. Beginning installation means contractor accepts existing conditions.

E. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

F. If any installed cable is kinked to a radius less than recommended dimension the contractor shall replace it at no additional cost to the project.

G. The system will be tested and documented upon completion of the installation as defined in the Section below.

3.2 COOPERATION

A. The Contractor shall cooperate with other vendors and County personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the County, provided such decision is reached prior to actual installation.

3.3 COORDINATION

A. Verify exact lock control and wiring requirements with actual equipment being supplied.

3.4 TESTING AND ACCEPTANCE

A. This Contractor shall conduct tests to determine system conformance to requirements of this specification. Tests shall be conducted in the presence of the Engineer or his authorized representative who may suspend or discontinue the tests at any time performance is considered unsatisfactory. Resumption of testing will cover untested elements and any replaced elements. This contractor shall furnish test instruments and equipment of the accuracy necessary to perform the test. Arrangements for testing

must be made with the Engineer at least two weeks before the proposed testing date. The institution's technician shall also be present during testing.

B. Testing shall verify function and operation of all relays, switches, door locks and indicator lights for proper function including the verification of all interlock, emergency group release and staggered release sequencing.

C. Contractor shall maintain a running list of all doors determined to be mechanically defect in operation. Submit list to the General Contractor, the Div. 11 - Detention Equipment Contractor and the Security Electronics Consultant.

D. The SEC shall visually inspect all equipment to insure that they are complete and conform to the requirements defined herein. The contractor shall provide the Engineer with a written certification that this inspection has been made

E. The SEC shall conduct acceptance testing according to a schedule coordinated with the Owner. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall provide a minimum of one (1) week advance notice to the Engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.

F. IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

G. Tests related to connected equipment of others shall only be done with the permission and presence of others involved.

H. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

3.5 DOCUMENTATION

A. Upon completion of the installation, the contractor shall provide 3 full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed below.

1. Connection matrix showing fiber strands used to activate LAN on existing cable plant

B. All documentation, including hard copy and electronic forms shall become the property of the County.

3.6 WARRANTY

A. The SEC shall guarantee all materials, equipment, etc. for 1 year from date of substantial completion of this work. This guarantee shall include all labor, material and travel time. See Division 01 - GENERAL CONDITIONS, and Division 00 - GENERAL REQUIREMENTS - Guarantee Documents for further requirements.

3.7 WIRING

A. All wiring shall be in conduit. Refer to the security system wiring legends and riser diagrams on the drawings.

B. All wiring shall be in conduit by Division 26 in accordance with the requirements of Section 26 13 00 – Raceway and Boxes.

C. Wiring for locks and doors is indicated on the Drawings.

D. All power wiring for 24 volt or 120 volt sliding door gates, doors or locks shall have a separate green equipment ground conductor.

E. All wiring for status indicators of electric locks and the control and status of pneumatic doors shall utilize 18 AWG multi-conductor cable under a common outer jacket and shall be installed in common raceways and equipment's enclosures with other conductors for locking devices within the limitations defined by Article 725-15 of the National Electrical Code for Class 2.

F. Wiring for electro-mechanical lock control will be No. 14 AWG-CU THHN/THWN.

G. Refer to the Security Control Point Schedule for reference to lock types and the lock wiring diagrams on the drawings for wiring requirements.

H. All conductors shall be stranded copper.

3.8 INMATE PHONE CONTROL

A. Provide 110 punch blocks in Security Electronic Equipment Rooms as indicated on the Drawings. Extend telephone cable (4/C per inmate phone location) through the 4-pole relays in designated room PLC and terminate to the punch block. Label each inmate phone location at the punch block. Inmate phone system installer will terminate their inmate phone cables to the punch block for control of the phones from the SS system.

END OF SECTION

SECTION 28 46 20
SECURITY SYSTEM NETWORK SWITCHES

PART 1 - GENERAL

1.1 SCOPE

A. Applicable provisions of Division 01 shall govern all work under this Section.

B. All equipment described in this section shall be provided by the SEC Contractor as described in Section 28 46 00.

C. This section describes the products and execution requirements relating to furnishing and installing network equipment and related sub-systems as part of a dedicated security network for the new Video Surveillance System for this project. Electronic equipment as well as passive components is covered under this document.

D. Contractor is to provide and install a complete and working dedicated LAN for this project utilizing new cable to provide a complete and working system. All equipment, cables and related hardware shall be furnished, installed, tested, labeled, and documented by the Contractor, as detailed in the following sections.

E. Basic Electrical Requirements are applicable to all Division 28 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 10 – Security System Control and Monitoring

D. Section 28 46 20 – Security System Network Switches

E. Section 28 46 30 –Voice Communication System

F. Section 28 46 40 – Card Access System

G. Section 28 46 60 – Video Surveillance System

1.3 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable standards are as follows:
1. ANSI/IEEE C2 - National Electrical Safety Code

2. NFPA 70-2005 - National Electrical Code
3. TIA/EIA Standards 568-B, 606A
4. IEEE 802.3 Standards for Ethernet

1.4 WORK SEQUENCE

A. During the construction period, coordinate schedule and operations with the Sedgwick County Adult Correctional Facility Representative and Owner.

B. For additional information pertaining to the sequencing of the work refer to Article 13 of the General Conditions.

C. Installation shall be sequenced to accommodate the Owner's occupancy requirements. See Division 01, General Conditions (Work Sequence).

1.5 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:
1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

B. Submittals shall be original catalog sheets or photocopies thereof. Facsimile (fax) sheets shall not be accepted.

C. Work shall not proceed without the Engineer's approval of the submitted items.

D. If materials are furnished as specified no further qualifications is necessary, except for items requiring shop drawings. However, if the Contractor wishes to substitute another manufacturer and/or catalog number, the following information in triplicate shall be submitted to the Engineer:
1. A complete description of the material which the contractor proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to the Owner.

E. The Contractor shall receive approval from the Engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the Engineer.

1.6 PROJECT RECORD DOCUMENTS

A. Submit record documents under per Div. 01 General Requirements.

B. Accurately record exact sizes, locations and quantities of equipment.

1.7 QUALITY ASSURANCE

A. The manufacturer shall be a company specializing in LAN equipment with a minimum of five years documented experience in producing LAN equipment similar to those specified below.

B. The SEC shall have been in this line of business for a minimum of 5 years and completed 4 jobs of the magnitude specified in the following sections.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products to and receive products at the site under provisions of Division 01 - General Requirements.

1.9 DRAWINGS

A. It shall be understood that the Network Equipment details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The Contractor shall verify all conditions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within 10 days prior to the bid due date.

1.10 ALARM INTEGRATION

A. Provide remote monitoring of status of each individual security network switch by County IT personnel.

B. Program security network switches to provide SNMP E-Mail alert to County IT manager upon activation of failure or alarm status.

C. Provide conduit/cabling to existing Owner's administrative network switch as required for E-mail alert integration.

D. Coordinate administrative network integration with County IT manager.

PART 2 - PRODUCTS

2.1 NETWORK COMPONENTS

A. LAN SWITCH

1. Redundant LAN switches for the security network shall be provided with layer 3 switches to provide separation between the various networks operational in the Sedgwick County Adult Detention Facility. LAN switches shall be powered by 24VDC or 120VAC. Any variation in the power requirements shall be the responsibility of this contractor to coordinate with other trades.

2. Provide a network that shall include redundant connections between the PLC system, video graphic interfaces, audio system, camera system, and other integration system CPU.

3. This network shall be a high speed, fault tolerant, self healing, Ethernet industrial communication network. It shall be a 1 gigabit star topology network using fiber optic media as required and be in compliance with IEEE 802.3. All switches shall be managed.

4. Network switches shall be capable of providing wireless access points as add on modules.

5. Provide PoE power on switch ports where applicable.

B. DOOR CONTROL, CARD ACCESS AND DURESS ALARM NETWORK

1. Manufacturer/Series:
   a. Phoenix Contact MMS Series
   b. Hewlett-Packard 1910 Series
   c. Hirschmann Mice Series

d. Cisco 3750 Series

C. VIDEO SURVEILLANCE NETWORK
1. Manufacturer/Series:
   a. Cisco 3750 Series
   b. No known Equal

D. MEDIA CONVERTERS
1. Media converters for network switches will be provided by the SEC. The media converters shall be installed and made operational by this contractor

E. FIBER OPTIC PATCH CABLES
1. The Fiber Optic patch cables shall be 50/125-micron multi mode fiber utilizing tight buffer construction. The fiber optic patch cables shall be minimum 1.5 meters in length.

2. Fiber Optic jumpers shall incorporate Ceramic or Metallic tipped LC type connectors on one end to match the fiber optic cabling installed under section 27 00 00. Connectors to owner provided equipment shall be as required to connect to equipment. Connectors used in fiber optic patch cables shall meet requirements set forth in the Fiber Optic section of section 27 00 00.

3. Channels in duplex patch cables shall be of equal length.

4. Cables shall be aqua in color.

5. The contractor shall provide thirty 30 Fiber optic Patch Cables (duplex).

F. CAT 6 PATCH CABLES
1. The copper patch cables provided under this contract shall be four pair, category 6 rated cables. Each cable shall be performance tested for conformance to the TIA/EIA-568-B standards for category 6.

2. Cables shall be terminated in RJ45 plugs on each end of the cable.

3. These cables shall be minimum 2 meters in length. The length of these cables shall be sufficient to route the cable through existing cable managers.

4. Cables shall be green in color.

5. Cables shall be snagless.

6. Contractor shall supply sufficient cat 6 patch cables to connect all cameras, Network video recorders, storage devices and miscellaneous equipment to provide a complete and working system.

2.2 POE POWER INJECTOR

A. MANUFACTURERS
1. Veracity
2. Pelco
3. Approved Equal

B. MINIMUM REQUIREMENTS
1. The device shall meet the demanding data rate and power requirements of the attached IP cameras with high-quality streaming video capabilities.

2. The device shall meet the IEEE 802.3af standard for detection, connection, disconnection, and fault protection.

3. The device shall be compatible with 10/100 Base-T systems and systems up to 1000 Mbps.

2.3 API INTEGRATION

A. An application programming interface (API) is provided for the security network. The API provides programmatic access to the network-connected components managed by the security network.

B. Communication between the security network takes place through the TCP/IP networking protocol. The API is invoked by POSTing an HTTP message to the web server on the network controller.

C. The API supports commands for:
1. Pinging the security network system to determine its health, and retrieving the current version of the API from the server.

2. Adding, modifying, deleting, and retrieving time specifications and time specification groups.

3. Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.

4. Requesting events from the Activity Log that occurred within a specified time period. These events are returned from the API in the CSV Export report format.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified.

B. Refer to Project Drawings that indicate the equipment location within each building.

C. It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

D. Beginning installation means contractor accepts existing conditions.

E. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

F. If any installed cable is kinked to a radius less than recommended dimension the contractor shall replace it at no additional cost to the project.

G. The system will be tested and documented upon completion of the installation as defined in the Section below.

3.2 COOPERATION

A. The Contractor shall cooperate with other vendors and County personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the County, provided such decision is reached prior to actual installation.

3.3 TESTING AND ACCEPTANCE

A. The contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed.

B. The SEC shall visually inspect all equipment to insure that they are complete and conform to the requirements defined herein. The contractor shall provide the Engineer with a written certification that this inspection has been made.

C. The SEC shall conduct acceptance testing according to a schedule coordinated with the Owner. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall provide a minimum of one (1) week advance notice to the Engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.

D. IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

E. Tests related to connected equipment of others shall only be done with the permission and presence of others involved.

F. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense.

3.4 DOCUMENTATION

A. Upon completion of the installation, the contractor shall provide 3 full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed below:

1. Connection matrix showing fiber strands used to activate LAN on existing cable plant

2. All documentation, including hard copy and electronic forms shall become the property of the County.

3.5 WARRANTY

A. The SEC shall guarantee all materials, equipment, etc. for 1 year from date of Substantial Completion of the Work. This guarantee shall include all labor, material and travel time. See Division 01 General Requirements.

END OF SECTION

SECTION 28 46 30
VOICE COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the requirements for a voice communication system as an integral part of the security control processing equipment.

B. The SEC Contractor as described in Section 28 46 00 shall provide all work and equipment described in this Section.

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 10 – Security System Control and Monitoring

D. Section 28 46 20 – Security System Network Switches

E. Section 28 46 40 – Card Access System

F. Section 28 46 50 – Duress Alarm System

G. Section 28 46 60 – Video Surveillance System

1.3 PRODUCTS

A. Individual call buttons or call buttons mounted on remote intercom stations shall interface call icons of SES touch screens to speaker/microphones, ceiling speakers and push-to-talk switches. The system shall integrate to the PLC/touch screen system via Ethernet communication protocol.

B. The system shall utilize digital audio technology for door control intercom, cell intercom, and dayroom sound monitoring (two-way) and sound threshold monitoring.

1.4 DUAL OPERATED CONTROL STATIONS

A. The audio busses for PC-MA, MB, MC and MD shall be independent of each other including the interface to the video surveillance system camera call-up function. Each touch screen shall have the ability to take intercoms and have the cameras to their assigned monitors without affecting the operation of the other. Provide separate “audio follows video” interfaces.

1.5 CENTRAL EXCHANGE INTERCOM SYSTEM

A. The SS Contractor shall be certified by the manufacturer of the system selected by the SS Contractor. A letter shall be submitted to the Engineer from the manufacturer that describes the certification level attained and a description of the certification levels available. The installer of this equipment (actual SS Contractor assemblers and programmers assigned to this project) shall have been certified within the last 5 years.

B. Acceptable Manufacturers:

1. Harding Instruments DXL
2. Jeron Spectrum 430/460

C. The following specifications are based upon Harding Instruments to establish functionality and level of quality.

D. DIGITAL COMMUNICATION CONTROLLERS (DCC's)
   1. Digital Communication Controllers and Digital Communication Expanders are to be interconnected to form an intercom exchange capable of independent local operation from each SS touch screen location. System capacity is to be increased by connecting up to four Digital Communication Expanders to each DCC. Each DCC and DCE is capable of 32 intercom stations each.
   2. Multiple DCC's are to be networked together via digital audio trunks and Ethernet data networks to form larger systems. Each DCC is to include as required:
      a. Process Control Card (PCC)
      b. Central control Card (MCC)
      c. Station Control Cards (SCC's)
      d. Internal PCI card.
      e. Front panel keypad/display for system setup and maintenance.
   3. Process Control Cards are to contain:
      a. System configuration and data, control exchange operations and switching, and provide exchange network ports.
      b. USB network ports for exchange expansion.
      c. Ethernet network ports for system expansion and external control by touch screen computers.
      d. Fiber optic or copper digital audio trunk ports. Two serial ports.
      e. An internal modem for transmitting and receiving data over a telephone line.
   4. Central control Cards to include:
      a. Ports for any combination of two intercom or telephone set master stations.
      b. Two line level audio inputs with status and control.
      c. Two line level audio outputs with status and control.
      d. Convert incoming audio signals to digital format and outgoing signals to analog format.
      e. Intercom master station audio, press-to-talk and hook switch status transmitted over two single shielded pair cables with wiring supervision to detect open circuit and short circuit faults.
      f. Telephone set master station functions all transmitted over a single wiring pair.
   5. Station Control Cards:
      a. Each provides sixteen half-duplex intercom station ports which can be employed in adjacent pairs for full duplex devices (handsets).
      b. Provide an interface for intercom stations. Units to convert incoming audio signals to digital format and outgoing signals to analog format.
      c. Each card interfaces with 16 half-duplex channels. Each channel includes a separate audio power amplifier for non-blocking call operation and sixteen (16) independent software controlled volume settings.
      d. Audio and switch functions on generic Intercom station control cards to be transmitted on separate wiring pairs.

E. DIGITAL COMMUNICATION EXPANDERS (DCE's)

1. Digital Communication Expanders to provide master station and intercom features similar to the DCC's to facilitate exchange expansion. Each DCE to include a slave Process Control Card (PCC) without exchange control or network functions, a Central control Card (MCC), two Station Control Cards (SCC's).

F. ADMINISTRATION SOFTWARE
   1. Administrator Software to function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.
   2. Administrator Software to employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.
      a. Configuration features to include:
      b. Creation of overall system architecture.
      c. Creation of multiple device templates.
      d. Copy and paste functions with auto-numbering and auto-assignment to create device schedules.
      e. Configuration error detection and alerts.
      f. Device naming and call routing functions.
      g. Device setting and performance functions.
   3. Diagnostic and Maintenance features to include:
      a. Verification of system configuration and installation, system networks, device connections and system operation.
      b. Diagnostics via modem or Ethernet ports.
   4. Logging features to include:
      a. Display of system activity with filtering options.
      b. Search by time and date, search by device and search by parameter.

G. INTERCOM STATION BOARDS
   1. Intercom station boards are to be used to interface generic intercom stations and loudspeakers to system station audio boards for two-way voice communication or audio monitoring.
   2. Units are to include microphone preamplifier, line supervision electronics, multiplexing electronics, and loudspeaker transformer. Units are to include pigtail and switch options as required for each location.

H. AUDIO TRANSFORMER BOARDS
   1. Provide audio transformer boards as required to accommodate existing 8 ohm intercom speakers.
   2. Existing intercom stations do not include 25 volt local transformers. Equip audio head end system with matching 25 volt transformers for each existing intercom station.

I. TOUCH SCREEN INTERCOM MASTER STATIONS
   1. Touch screen intercom master stations to consist of audio interface module and desktop loudspeaker/mic module.
   2. Audio interface to consist of:
      a. Network and power supply interface, audio amplification and processing module, network and operating status LED's.
      b. External microphone interface with phantom power capability.
      c. External loudspeaker interface.
      d. Telephone handset and press-to-talk switch interfaces.
      e. Headset jack.
   3. Desktop loudspeaker/mic unit is to include compact, slim line bottom plate with stainless steel face, and rubber shock isolation mounting feet. Unit to

include 12 inch, black, slim line electret gooseneck microphone, front mounted loudspeaker and front mounted rotary volume control.

1.6 REMOTE INTERCOM STATIONS – INTERIOR

A. Door frame mounted intercom stations shall be designed for mounting in standard 2-gang outlet box. Faceplates to be constructed of 11-gauge brushed stainless with internal steel offset grille to restrict inserting objects through speaker grille. Attachment screws shall be security types in compliance with Section 11 20 00 - Security Fasteners.

B. Each intercom station is to incorporate an internal loudspeaker of the mylar cone type to resist damage from soil and sprays, a microphone preamplifier and function multiplexing circuitry board. One intercom call pushbutton is to be provided on each station. Pushbuttons are to be single piece stainless steel construction and are backstopped to prevent excessive travel. Switch to have positive tactile action with 1 million-operation lifetime. Pushbuttons are to be software assignable for placement of call requests.

C. All intercom station functions to be transmitted over a single shielded pair cable.

D. Assembly shall be able to withstand damage caused from physical abuse, moisture, corrosion, dust, vibration and temperature extremes from 150 degree F. to –10 degree F.

E. Stations shall mount on a standard 2 gang, 3½" deep box.

F. All intercom stations shall be as manufactured by Quam, catalog no. CIS4/25.

1.7 REMOTE INTERCOM STATIONS – EXTERIOR

A. Identical to interior stations except that all metal plates and hardware to be stainless steel, and internal circuitry and components to be uniformly coated with silicone based caulk to prevent moisture to electronic components. A shroud shall be provided to protect the intercom from direct exposure to rainfall.

1.8 HANDSET INTERCOM STATIONS

A. Provide a direct talk intercom station with handsets for private conversation between officer control station and the dayrooms in the housing pods as indicated on the drawings.

B. The selection of the icon at the SS touch screen shall interface with the remote intercom handsets via security control processing equipment units as specified in Section 28 46 02.

C. The telephone handsets in the inmate housing pod dayrooms shall be mounted on wall cradles and constructed of high impact plastic with heavy duty stainless steel armored cord which when extended shall not exceed 24 inches in length. The audio path to the officer control station shall be identical to that used for the standard wall mounted intercom stations. The handsets shall not require press to talk switch to establish communications. Audio communication shall be established when initiated at the remote location via a call-in pushbutton (per detail on the drawings) or at the contractors option, a hookset cradle switch and selected at the officer control station. Hook switch and cable shall be mounted on a two gang, 11 gauge stainless steel plate.

D. Receiver and transmitter covers shall be non-removable and glued to the handset.

E. Attachment screws shall be security types in compliance with Section 11 20 00 - Security Fasteners.

F. System shall be wired to be completely void of crosstalk.

1.9 REMOTE MONITORING/INTERCOM SPEAKERS

A. Furnish speakers in all areas as indicated on the plans. Properly adjust the system after all speakers are connected to the system.

B. The loudspeaker shall be:

1.	Ceramic magnet, ozs:	10
2.	Voice coil impedance, ohms:	8-10
3.	D.C. resistance, ohms:	7.4
4.	Power handling, watts RMS:	10
5.	Frequency response, Khz:	60-16
6.	Resonance frequency, Hz:	90
7.	Sensitivity, db:	96
8.	Dual cone, diameter, inches:	8
9.	Power rating, volts:	multi-tap 25 or 70
10.	Power rating, watts:	4
11.	Primary taps, watts:	¼-½-1-2-4
12.	Loss, db:	1.2
13.	Load, ohms:	8

C. Speakers shall be Atlas-Soundelier, Lowell or Quam.

D. Secure area speakers are identified on the drawing with an “S” adjacent to the symbol.

E. See floor plans for specific locations to be programmed for sound threshold monitoring.

F. Flush mounted loudspeakers in security areas shall consist of a vandal proof baffle constructed cast aluminum alloy with a tensile strength of 44,000 psi with a 22 gauge perforated stud-mounting adapter plate. The baffle shall mount to backbox with security screws in compliance with section 11 20 00 and be constructed of cold rolled steel with rust preventative finish and undercoated to eliminate mechanical and acoustical resonances.

G. Surface speakers in security areas shall consist of a vandal proof baffle constructed cast aluminum alloy with a tensile strength of 44,000 psi with a 22 gauge perforated stud-mounting adapter plate. The baffle shall mount to a surface backbox constructed of cold rolled steel with welded corners and a white rust preventative textured finish and undercoated to eliminate mechanical and acoustical resonances.

H. All exposed fasteners shall be tamperproof in compliance with Section 11 20 00.

1.10 NON-AUDIO CALL STATIONS

A. Wall mounted non-audio call stations shall be designed for mounting in standard 1-gang outlet box. Pushbuttons are to be single piece stainless steel construction and are backstopped to prevent excessive travel mounted to a faceplates constructed of 11-gauge brushed stainless steel. Pushbuttons are to be software assignable for placement of call requests. Attachment screws shall be security types in compliance with Section 11 20 00 - Security Fasteners.

1.11 LOCAL INTERCOM HANDSET STATIONS

A. Provide a direct talk intercom station with handsets for private conversation between correctional officer and public as indicated on the drawings.

B. The telephone handsets shall be mounted on wall cradles and constructed of high impact plastic with heavy duty stainless steel armored cord which when extended shall not exceed 25 inches in length. The handsets shall not require press to talk switch to establish communications. Hook switch and cable shall be mounted on a two gang, 14 gauge stainless steel plate.

C. Handsets shall be standard 500 series, Soundolier model CE-2-AC-25" cord. Receiver and transmitter covers shall be glued to the handset.

D. System shall be wired to be completely void of crosstalk. Talk voltage will be derived from a DC power supply/control unit and isolation chokes.

E. Power supply/controller shall be sized for quantity of handset pairs at location with Soundelier no. PVP-24 control unit and PVP-6 plug-in interface modules. Equal equipment by Dukane or Rauland.

1.12 SPARE PARTS

A. Provide the following spare parts:
   1. 1 interior and 1 exterior intercom station.
   2. 1 vandalproof speaker and baffle.

PART 2 - EXECUTION

2.1 WIRING

A. All wiring shall be installed in conduit in accordance with the requirements of Div. 26 – Electrical.

2.2 COORDINATION

A. Coordinate the installation of the elevator intercom with the elevator supplier. Provide a template for the intercom station and turn over to the elevator installer along with the intercom station. The intercom station shall be installed in the elevator cab by the elevator supplier. Cabling for the intercom is provided by the elevator installer.

2.3 INSTALLATION

A. Selected intercom stations will be mounted in detention security doorframes others will mount in wall boxes. The various locations are indicated on the drawings as "F' for door frame mounted or "W" for wall mounted. Intercoms mounted in 2 gang boxes can mount vertically or horizontally to accommodate mounting in doorframe.

B. Install vehicle loop detector in strict accordance with manufacturer's instructions. Contractor shall note that this will require coordination with the concrete pour of the vehicle sally port slab.

C. Coordinate opening, backbox and conduit routing requirements with detention frames specified in Section 11 19 10 - Detention Hollow Metal Doors and Frames.

D. Identify wiring at both ends with adhesive labels.

E. All exposed fasteners shall utilize security screws in compliance with Section 11 20 00 – Security Fasteners.

2.4 ADJUSTMENTS

A. Demonstrate the volume levels of the intercom cell background music with the Owner and adjust to the Owners satisfaction.

B. Test each intercom for audibility. Intercoms shall be clear of any hum or hiss caused by ground shield conditions and stray currents.

END OF SECTION

SECTION 28 46 40
CARD ACCESS SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This specification is for a security card access control system that shall perform the following:
   1. Access control
   2. Alarm monitoring
   3. Reporting functions
   4. Security management functions
   5. ID badge printing and integrated database
   6. Interface to the security controls of SES specified in Section 28 46 00.

B. The SEC contractor as described in Section 28 46 00 shall provide all work and equipment of this Section.

C. The SEC Contractor shall include all necessary labor; tools, equipment, and ancillary materials required to furnish and install a complete and operational card access control and alarm monitoring system.

D. Basic System Requirements:
   1. Proximity card design
   2. Card access integrated with facility badging system
   3. Web based user interface accessible with common web browsers. Remote web access to include integrated video surveillance monitoring.
   4. Network based card access system driven off category cable with readers receiving power from PoE ports within the network switch – See Section 28 46 10.
   5. Traditional power for the locking devices – See Section 28 46 10.
   6. Headend constructed using non-proprietary, open-platform control panels furnished by Mercury Security Corporation. Headend of system must be constructed in a manner that allows any software to be run on the system while utilizing the same readers, power supplies, management PC, and card reader control cabinets regardless of what software is installed.

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 10 – Security System Control and Monitoring

D. Section 28 46 20 – Security System Network Switches

E. Section 28 46 30 –Voice Communication System

F. Section 28 46 50 – Duress Alarm System

G. Section 28 46 60 – Video Surveillance System

1.3 QUALITY ASSURANCE

A. Manufacturer of products defined in this section must have:

1. 10 years experience in manufacturing and servicing of access management systems.

B. Equipment shall comply with the following standards and codes:
   1. NEC Compliance: All electrical wiring work shall comply with NEC.
   2. NEMA Compliance: Electrical equipment shall comply with applicable portions of NEMA.
   3. FCC Emissions: All assemblies shall be in compliance with FCC emission standards.
   4. Microprocessor based controller: Part 15, Subpart F, Class A.
   5. Digital proximity Card Reading Sensors: Part 15, Subpart F.
   6. UL 294 Standard for Access Control System Units
   7. UL-1012 and CSA: All power supplies shall be in compliance with Underwriters Laboratories standard 1012 and CSA standards for power supplies.

C. The SS Contractor upon completion of the work shall provide the Owner and Engineer with the following:
   1. Complete information and drawings describing and depicting the entire System as installed, including all information necessary for maintaining, troubleshooting and/or expanding the System at a future date.
   2. Complete documentation of System testing.
   3. Certification that the entire System has been inspected and tested, is installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and UL listings, and is in proper working order.

1.4 APPROVED SOFTWARE MANUFACTURERS

A. Indenticard Systems Inc.

B. No known equal

1.5 APPROVED HARDWARE MANUFACTURERS

A. Mercury Security Corporation – Long Beach, CA

B. No known equal

1.6 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:
   1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The Card Access Control System shall include, but not limited to the following:
   1. Wall mounted central controllers.
   2. Digital proximity card reading sensors.
   3. Monitor inputs
   4. Relay outputs
   5. Request to exit devices
   6. Wiring, power supplies, switches and ancillary equipment.

B. The Card Access Control System within the building shall consist of IP-based controllers, proximity card readers, controller software, host hardware and software and accessories. To accommodate growth and to facilitate implementation of future technologies, the system components shall utilize open-architecture.

C. A single-system database shall maintain both cardholder records for creating custom photo identification badges, as well as access system information and all programming parameters.

D. The system shall control access entry to the building as shown on the drawings and selected areas using proximity cards. The system shall be capable of supporting multiple access control technologies at each door.

E. Restrict Access of individual cardholders by time of day, day of week and specific points of entry via system software.

F. Unlock Doors: to building and selected areas automatically for a scheduled period of time throughout the day allowing free access and egress without the use of a card and avoiding the generation of an alarm condition on the access control system.

2.2 GENERAL

A. The security management system shall be implemented through network appliance architecture with a three-tiered modular hardware hierarchy and embedded three-tier software architecture.

B. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.

C. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.

D. Security of the data communicated over the network to and from the browser, network controller, and nodes is protected by encryption (SSL 128-bit) and authentication (SHA-1).

E. The top hardware tier is the network controller. Embedded on the Network Controller are an operating system, a web server, security application software, and the database of personnel and system activity.

F. The middle hardware tier is the network node. The network node shall make and manage access control decisions with data provided by the network controller, and it shall manage the communication between the network controller and Application blades connected to the system's inputs, outputs, and readers. This modular design makes it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs are automatically re-integrated.

G. The bottom hardware tier is the Application Blades. Four unique Application blades shall be available:
   1. Access Control Blade: shall support two readers, four supervised inputs, and four relay outputs.
   2. Alarm Input Blade: shall support eight supervised inputs.

3. Relay Output Blade: shall support eight relay outputs.
4. Temperature Blade: shall support eight analog temperature sensor inputs.

H. The security management system shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.

I. The database tier shall use PostgreSQL. PostgreSQL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and high reliability relational database that is embedded without requiring the use of a separate PC server.

J. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.
1. The web browser shall provide UL 1076 compliant browser-based monitoring and incorporate asynchronous Javascript™ and XML technology (AJAX) for a faster user experience.

K. The security application software tier contains the business logic. This application shall also be embedded on the network device and requires no additional memory or processing power.

L. Software design runs within an embedded Linux operating system and shall require no client-side software other than a web browser.

M. All equipment and materials used shall be standard components, regularly manufactured,
and regularly utilized in the manufacturer's system.

N. All security management systems and components shall have been thoroughly tested and proven in actual use.

O. All security management systems and components shall be provided with an explicit manufacturer warranty of one year for software and two years for hardware.

2.3 OVERALL SYSTEM CAPABILITY

A. The security management system shall meet the requirements of business and government access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring, communications loss monitoring, and temperature monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

B. Widget Desktop: The security management system shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop. Each widget shall provide easy access to a frequently used function—allowing users to, for example, view an activity log, a camera view, or real-time web content. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which

widgets are available in a layout and the extent to which users can customize the layout.

C. System Partitioning: The system administrator shall have the ability to divide the system into partitions, allowing subsets of the overall population and/or resources to be managed separately.
   1. From the default Master partition, one or more additional partitions can be created.
   2. Each partition shall contain some number of administrators, card holders with their credentials, and resources.
   3. When performing administrative functions, the administrator of a partition shall have the ability to affect only the cardholders and resources in that partition. However, resources can be shared across partitions through the mapping of access levels from one partition to another.
   4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.

D. The security management system shall provide the following Access Control capabilities:
   1. Integrated photo ID creation capability with video verification.
   2. User interface secured access under encrypted password control.
   3. System-wide timed anti-passback function.
   4. Regional anti-passback with mustering and roll call functions.
   5. Region occupancy counting and control.
   6. “First-in-unlock” rule enforcement.
   7. Multiple access levels and cards per person.
   8. 128-bit card support for Weigand card readers.
   9. Detailed time specifications.
   10. Simultaneous support for multiple card data formats.
   11. Access privileges variable by threat level.
   12. Scheduled portal unlock by time and threat level.
   13. Card format decoder quickly discovers unknown card formats.
   14. Card enrollment by reader or keyboard.
   15. Compatibility with various input devices, including biometric readers.
   16. Activation/expiration date/time by person with one minute resolution.
   17. Access level disable for immediate lockdown.
   18. Use of Threat Levels to alter security system behavior globally.
   19. Multiple holiday schedules.
   20. Timed unlock schedules.
   21. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.
   22. Card enrollment reader support.
   23. Counted-use access control.
   24. Dual-reader portal support.
   25. Wiegand Reader support.
   26. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.
   27. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
   28. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.
   29. Integration with supported alarm panels.
   30. Optional storage and recall of ID photos and personal/emergency data.
   31. Up to 60,000 person records.

E. The security management system shall provide the following Monitoring capabilities:
   1. Common alarm panel integration for disarm on access, and arm on egress.

2. Integrated alarm monitoring and event management with alarm panels.
3. Support for the direct viewing of IP cameras.
4. Integrated real-time IP, DVR, and NVR systems with stored video replay for events.
5. Provides alarms on video loss, video motion detection, and video restore events.
6. Virtual inputs for video loss and building-occupancy-limits-exceeded.
7. Provides alarms on communication loss and temperature variation.
8. Support for the creation of custom sets of alarm event actions.
9. Provides the ability to record video and link to video for alarm events.
10. Available video control and playback through the user interface.
11. Provides the ability to assign threat levels to various alarms according to severity.
12. Provides the ability to select up to 20 levels of priority for event actions.
13. Support for electronic supervision of alarm inputs.
14. Support for the use of output relays for enabling circuits under alarm event control.
15. A monitoring desktop that integrates video, system activity logs, floor plans, ID photos,
16. and alarm notifications.
17. Support for the creation of unlimited customized monitoring layouts through the use of widgets.
18. Graphic floor plans with active icons of security system resources.
19. System user permissions to grant whole or partial access to system resources, commands, and personal data.
20. Secure access to the user interface under encrypted password control
21. Delivery of alerts via browsers, email, and text messages.

F. The security management system shall provide the following Video Management capabilities:
   1. Real-time video monitoring displays, including unlimited cameras simultaneously.
   2. Playback of event-related video.
   3. Video switching and video widget pop-ups based on access activity or event activation.
   4. Integrated alarm inputs from the video management system.
   5. Digital playback of video events.
   6. Linking of video and events based on triggers provided by the security management system or video system.
   7. Support for multiple DVR and NVR systems.
   8. Multiple pre-programmed supported cameras.
   9. Recall of photo ID and real-time image for comparison.
   10. Monitoring and control through a web browser interface.
   11. System user permissions to grant whole or partial access to system cameras and video resources.

G. The security management system shall provide the following Security Database capabilities:
   1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
   2. Partitions: It shall be possible to partition the system to create independent, virtual security management systems for multiple populations.
   3. Support for the sharing of access levels and user privileges across partitions in a system.

4. Built-in Open Database Connectivity (ODBC) compliant database for personal data.
5. LDAP integration for single-user logon authentication.
6. Up to 60,000 person records.
7. Network-secure API for external application integration.
8. Extensive and easy to use custom report generator.
9. User-defined data fields in personnel records.
10. Record recall by vehicle tag, name, or card.
11. ODBC compliant Database.
12. An API for adding to, deleting from, and modifying the database.
13. Storage of system user passwords and permissions.
14. Storage and recall of ID photos and emergency personal information.
15. Pre-defined reports on system configuration, system activity history, and people.
16. English-based query language for instant custom reports.
17. Custom report writer interface that allows the interactive creation of custom reports.
18. Reports may be saved for later reuse. No third party software (such as Crystal Reports) shall be necessary.
19. Periodic backup to on-board flash ROM and optional network attached storage (NAS), including FTP servers.
20. Periodic archive creation for historical custom reporting and improved on-board database performance.
21. Email and text messaging (SMS) alert notifications.

2.4 HARDWARE REQUIREMENTS

A. A card access workstation shall be provided as follows:
1. One workstation located in Office 104, which will be used for administration of the system, responsible for subscribing users, badge issuing and set up of priority levels and access groups.

B. HARDWARE PACKAGING REQUIREMENTS
1. The security management system shall have various hardware enclosures and configurations available to support different installation requirements. Enclosures shall be available for wall or rack mounting. The wall-mount enclosures shall have a lock requiring a key, and a cabinet door tamper switch.
2. The Wall-Mount enclosure supports one solid-state network controller/Node blade or a standalone Network Node blade and seven Application blades. The dimensions are: 17" (432 mm) H x 15" (381 mm) W x 6.75" (171.5 mm) D.
3. The 4U Rack-Mount enclosure supports one solid-state network controller/Node blade or a standalone Network Node blade and seven Application blades. The dimensions are: 19" (483 mm) W x 7" (178 mm) H (4U) x 15" (381 mm) D.
4. The solid-state controllers shall be powered by either 100-240V AC at 50-60 Hz, or by 12VDC at 3 amps. Power must come from a separate circuit with an isolated earth ground. If AC power is supplied it must be connected to the internal power supply. If DC power is supplied the internal power supply shall be bypassed. It shall be possible to backup power supplied to the security management system with an Uninterruptible Power Supply (UPS). It shall also be possible to place within the wall-mount enclosure an SLA battery backup sufficient for an orderly shutdown in case of external power loss.

C. NETWORK CONTROLLER, NODE, and APPLICATION BLADE SPECIFICATIONS

1. Solid-state network controller: All Application blades shall receive 12VDC power via the ribbon cable bus directly from the Node on the controller. The solid-state controllers shall be powered by either 100-240V AC at 50-60 Hz, or by 12VDC at 3 amps.

a. Network Nodes Supported: 32
b. RAM: 128 MB
c. Processor: Intel®IXP425
d. Flash ROM: 48 MB
e. Compact Flash Memory: 2 GB
f. Operating Temperature 32°to 122°F (0°to 50°C)

2. Access Control blade: The access control blade shall receive power via the ribbon cable bus directly from the Node Blade. The access blade shall supply up to 400 milliamps of power to one reader or 200 milliamps of power to each of two readers.

a. 7-pin reader connectors 2
b. Maximum reader wire length 500 feet (152 m) (18 AWG twisted, shielded)
c. Power available to readers 400 milliamps
d. 2-pin supervised input connectors 4
e. Maximum input wire length 2000 feet (610 m) (22 AWG twisted, shielded)
f. 3-pin relay output connectors 4
g. Maximum output wire length Determined by the peripheral device

3. Input blade: The input blade shall receive power via the ribbon cable bus directly from the Node Blade. It shall support a wide variety of input supervision types including normally-open circuit and normally-closed circuits, and zero, one or two resistor configurations.

a. 2-pin supervised input connectors 8
b. Maximum input wire length 2000 feet (610 m) (22 AWG twisted, shielded)

4. Output blade: The output blade shall receive power via the ribbon cable bus directly from the Node Blade. Both normally-open circuit and normally-closed circuit output devices shall be supported. The relay outputs shall support any output devices that operate on the following maximum electrical ratings: 30 Volts DC or AC, 2.5 Amps inductive or 5.0 Amps non-inductive.

a. 3-pin relay output connectors 8
b. Maximum output wire length 2000 feet (610 m) (22 AWG twisted, shielded)

5. Temperature blade: The temperature blade shall receive power via the ribbon cable bus directly from the Node Blade.

a. 2-pin analog temperature inputs 8
b. Maximum temperature wire length 1000 feet (305 m) (18 AWG twisted, shielded)

D. SOFTWARE REQUIREMENTS

1. Operating System and Application Software:

a. The embedded operating system for the solid-state network controller shall be Linux®. The disk-based enterprise network controllers shall use Ubuntu 10.04 LTS (long term support) as the operating platform. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.
b. The security management system application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.

2. Software Licensing:

a. Software licensing shall be based upon the number of readers and cameras for one network controller board. Software license upgrades shall be available if system reader and camera capacity must be raised. The user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.

b. Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more doors you will need a new Product Key. The Activation Key contains the warranty expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the Support : About page

3. Software Upgrades: Software upgrades shall be possible from a browser on any network-connected PC, by uploading a software update to the controller. Controllers shall automatically upgrade all connected nodes. No client software installation shall be necessary.

4. Online Help and Documentation: The security management system shall be provided with complete embedded documentation. The on-line documentation shall include:

a. Context-sensitive online Help. (The Help displayed is specifically relevant to the current screen.) The online Help system shall provide explanations and procedures for all monitoring, administrative, and system configuration and maintenance functions. The Help system shall have linked table of contents, a linked index, and frequently asked questions pages. Each topic shall also have links to related topics. Each Help topic shall be printable.

b. Technical Support Notes: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

c. Installation Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

d. Video Integration Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

e. System Administration Guide: This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics

f. The Help system shall also be available in a zip file format (xxx.zip) and it shall be possible to install the online Help system on any computer for purposes of reference and use by support personnel.

5. Support Collaboration: It shall be possible, by the use of a network Support Collaboration Tool, for a technical support specialist to connect to the security management system and assist on-site technicians from remote network-connected locations. It shall only be possible for an on-site system administrator or technician to initiate this connection. There shall be no way to initiate this connection from outside the secure network.

6. Language Support: The security management system shall be provided with multiple language support. The ability to switch from one language to another shall be accomplished through the user interface. Translation of the user interface, online help and documentation into other languages shall be available. The languages supported shall include:

a. English
b. Spanish
c. Portuguese
d. French
e. Italian
f. Thai
g. Chinese

h. Japanese

7. Date Formats: The security management system shall support global date formats as follows:
   a. mm/dd/yyyy
   b. dd/mm/yyyy
   c. yyyy/mm/dd
8. Floor Plans: The security management system shall provide graphic floor plan capability including graphic display of links to other floor plans, alarms, system resources such as portals, IP video cameras, inputs, outputs, and temperature monitoring points.
   a. The Network Administrator holding at least a 'Setup' user role shall be able to graphically configure device icons onto the floor plan images, and to upload additional floor plan images. JPEG images shall be supported, and the maximum size for a floor plan image shall be 256K.
   b. It shall be possible to create floor plan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floor plan group is assigned to a particular system user then the floor plans in that group shall be viewable by that system user.
9. Personnel Data: The security management system shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.
   a. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.
   b. A system user holding at least an 'Administer' user role shall be able to create, delete, and modify person records, including access levels.
10. Data Import and Export: A Data Management Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating, and ongoing populating, of cardholders into the security management system database. Data that shall be importable shall include:
    a. LASTNAME
    b. FIRSTNAME
    c. MIDDLENAME
    d. ACTDATE (activation date)
    e. EXPDATE (expiration date)
    f. NOTES
    g. TEXT1...TEXT20 (user defined fields 1 through 20)
    h. ACCESSLEVEL1...ACCESSLEVEL32
    i. PERSONID
    j. PIN
    k. ENCODEDNUM1...ENCODEDNUM10
    l. HOTSTAMPNUM1...HOTSTAMPNUM10
    m. CARDFORMAT1...CARDFORMAT10
    n. BADGELAYOUT
    o. JPEG ID PHOTO
    p. CONTACT PHONE
    q. CONTACT EMAIL
    r. CONTACT SMS EMAIL
    s. CONTACT LOCATION
    t. OTHER CONTACT NAME
    u. OTHER CONTACT TELEPHONE
    v. OTHER CONTACT TELEPHONE2
    w. VEHICLE 1 COLOR
    x. VEHICLE 1 MAKE
    y. VEHICLE 1 MODEL
    z. VEHICLE 1 STATE
    aa. VEHICLE 1 LICENSE#

bb. VEHICLE 1 TAG#
cc. VEHICLE 2 COLOR
dd. VEHICLE 2 MAKE
ee. VEHICLE 2 MODEL
ff. VEHICLE 2 STATE
gg. VEHICLE 2 LICENSE#
hh. VEHICLE 2 TAG#

11. Data Security:
    a. Communication between the network controller and the browser shall be secured using SSL. In addition, administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.
    b. Communication between the network controller and the Network Nodes shall be encrypted and authentication/tamper detection shall be done using the SHA-1 algorithm.
    c. Communication between the network controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.
12. Data Backups: It shall be possible to configure regular automatic database backups.
    a. It shall be possible to back up a solid-state network controller to an on-board compact flash.
    b. It shall be possible to back up an enterprise network controller to a built-in hard drive.
    c. It shall also be possible to save backups from any controller to separate network attached storage (NAS) and file transfer protocol (FTP) servers.
    d. It shall also be possible to setup regular automatic creation of database archive files.
13. On-board Data Management: Each night the security management system shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.
14. Partitions: It shall be possible to create multiple partitions for the management of multiple security systems or multiple populations.
    a. It shall be possible to limit access to the data and resources of one partition to those with permissions for that partition.
    b. It shall be possible for each partition to have its own population, resources, rules, events, video management, log data, reports and network resources.
    c. It shall be possible to grant Monitor, Administer, and Setup privileges for multiple partitions to the same user. It shall also be possible to create custom user roles for each partition.
    d. Each partition shall require at least one Node.
15. User Roles and Permissions: There shall be 4 pre-programmed levels of User Roles, and a total of 16 possible Custom User Roles that can be configured in the system, with different permissions for each user:
    a. Master Partition Monitor: These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the activity log, cameras, and floor plans.
    b. Master Partition Administer: These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the enrollment database, issuing and revoking cards, generating reports, and performing database backups.
    c. Master Partition Setup: These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default)

partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floor plan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings; performance of system maintenance such as database backup and restore, software updates and file cleanups; designation of time zone, daily backup schedule and enrollment readers.

d. Full System Setup: These users may use the functions of all menus in all partitions.
e. Custom User Roles: In addition to the roles above the system shall also support the creation of detailed user permissions regarding which cameras, floorplans, elevators, events, access levels, portals, reports, and personal data fields the system user may see, edit, delete, or control.

16. Alarm Panels: The security management system shall be capable of integrating with alarm panels, arming the panels, disarming the panels, and triggering events based upon alarm panel status.
17. Alarm Events: The security management system shall be capable of managing alarm events.
    a. It shall be possible to delay an input's change to the Alarm state by a specified number of seconds. The range of delay options shall be .5 seconds or 1-120 seconds.
    b. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:
        1) Lock and Unlock portals.
        2) Activate and Deactivate relay outputs.
        3) Arm and Disarm input groups.
        4) Pulse outputs or output groups.
        5) Arm and Disarm alarm panels.
        6) Send emails and SMS messages.
        7) Move cameras to preset positions.
        8) Switch to a video monitor.
        9) Record video.
        10) Momentarily unlock portals.
        11) Display ID photos.
        12) Change the system threat level.
        13) Make entries in the activity log.
        14) Play a digital sound file.
        15) Display alarms in different colors.
        16) Set a priority for an alarm (one of 20 levels, with 1 being the highest).
        17) Require a duty log entry.
        18) Clear alarm automatically or require an acknowledgement.
    c. A system user holding at least a "Setup" user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.
    d. It shall be possible to trigger events based on system activity such as:
        1) Video motion detection.
        2) Camera failure and camera restore events.
        3) Valid or Invalid card reads.
        4) Portals held or forced open.
        5) Valid card reads with a specified access level.
        6) Inputs entering an alarm state.
        7) High and low temperature events.
        8) Alarm panel arming failures.
        9) Alarm panel zone faults.
        10) Tailgating and passback violations.

11) Occupancy limit violations.
12) Zone empty violations.
13) Node power failure, communication failure, timeout, and tamper events.

18. Activity Monitoring
    a. The security management system shall support a monitoring desktop that integrates video, system activity logs, floor plans, ID photos, and alarm notifications.
    b. The system shall support the creation of custom monitoring layouts for the display of live video, system activity logs, alarm notifications, ID photos, floorplans, duty log entries, and portal status displays.
    c. It shall also be possible to view cameras, activity logs, and floor plans on separate monitoring pages within the application.
19. Network-based Camera and Video Surveillance: The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system's video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.
    a. Presets: The system shall support the creation, deletion, and editing of camera preset positions in the system. It shall also be possible to save changes in preset positions directly to a camera website.
    b. Views: The system shall support the creation, deletion, and editing of multiple camera views, specifically Quad views (four cameras). The application shall provide a drop down pick list for selecting current views or naming of new views.
20. Access Control:
    a. The security management system shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.
    b. Time Specifications: The system shall be capable of storing up to 512 time specifications. Each time specification must be assigned a unique alphanumeric name of up to 64 characters. The definition of a time specification shall require the assignment of both a start time and an end time. Each day of the week shall be individually assignable for inclusion in time specifications. Up to three holiday groups shall be assignable for inclusion in time specifications. If no holidays are assigned to a time specification then no holiday access shall be allowed.
        1) Time specifications shall be assignable to access levels, output groups, portal groups, input groups, and alarm events.
        2) Time specifications shall function appropriately per node for the time zone specified for that node
    c. Card Formats: The system shall support the use of readers that use the Wiegand Reader Interface. The system shall default to the Wiegand 26 bit format unless a different bit length format is created in the system. The system shall support but not require the use of the card facility code. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.
        1) It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, as well as designate parity bits.
        2) The system shall support up to 32 different card formats. The system shall support card formats up to 128 bits.

3) It shall be possible to reverse the read order of the bits in the facility code and/or card ID portions of a card format.
4) It shall be possible to view and change the default parity bit definitions for a card format.

d. Access Levels: The system shall be capable of storing up to 512 access levels in each partition. Each access level must be assigned a unique alphanumeric name of up to 64 characters. The definition of an access level shall require the assignment of a reader or reader group, and a time specification. It shall be possible to also assign an elevator floor group to an access level.

e. First-in Unlock Rule: The system shall support the use of a first in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs. The unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the First-in Unlock rule is satisfied and the unlock time spec is valid.

f. Holidays: The system shall be capable of storing up to 30 holidays per partition. Each holiday must be assigned a unique alphanumeric name of up to 64 characters. The definition of a holiday shall require a start date and an end date. Holidays shall have the ability to span several days using only one holiday slot. Holiday definitions shall support the designation of a start time and an end time. If no start time is designated then the system shall default to 00:00 (start-of-day). If no end time is designated then the system shall default to 24:00 (end-of-day). Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.

g. Portals: A portal is any access point and each portal supports up to two access reader devices. The System User, holding at least a “Setup” user role, shall be able to view current portal definitions, change portal definitions, delete portals, and create new portals. Creating a portal defines the access and alarm behavior of the access point. This can include:
1) Card readers and keypads.
2) Output for locking.
3) Input for monitoring the door switch.
4) Input for a Request-to-Exit function.
5) Local alarm outputs and system alarm events.

h. Portal Groups: It shall be possible to create groups of portals and to assign an unlock time specification to the entire group. All the portals in the group shall remain unlocked during the time specified.

1) It shall be possible to use portal groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a portal group is assigned to a particular system user then the portals in that group shall be viewable and unlockable by that system user.

i. Portal Alarm Conditions: Portals shall have four alarm conditions. The four alarm conditions are as follows:
1) Forced: When a portal is opened and there has been no card read, nor request to exit.
2) Held: When a portal is held open past the expiration of the shunt timer.
3) Invalid: When the portal reader reads a card for which there is no entry in the database.
4) Valid: When the portal reader reads a card for which there is a valid entry in the database.

j. Two-man entry restriction: It shall be possible to require two valid card reads by different cardholders within a specified number of seconds for entry to a specific portal.

k. Anti-passback: The system shall support both regional and timed anti-passback access control. For anti-passback functions, it shall be possible to configure regions, assign readers to those regions, and specify events for response to tailgate, passback, and occupancy limit violations. It shall also be possible to designate parent regions for hierarchical anti-passback.
    1) Grace: It shall be possible for a system Monitor or Administrator to Grace card holders from passback and tailgate violations.
    2) It shall also be possible to set a specific time for all cardholders to be Graced daily.
    3) The system shall be able to automatically place the cardholder in a predefined region upon the selection of the grace option
l. Mustering: To aid in evacuation management it shall be possible to designate a region or regions for mustering. It shall be possible to quickly get an occupancy count and occupant list for any region.
m. Scheduled Actions: It shall be possible to specify system actions to occur at scheduled times. These actions can include:
    1) Arming and disarming inputs.
    2) Activating and deactivating outputs.
    3) Locking and unlocking portals.
n. Floorplans: The system shall be capable of displaying active graphic floor plans and configuring each floor plan with icons representing system resources: cameras, portals, temperature points, and alarms. A network administrator holding at least a 'Setup' user role shall be able to upload floor plan images and graphically configure device icons onto the floor plan images. Viewing floor plans will require the Macromedia Flash Player 9.0 plug-in for the browser.
    1) It shall be possible to create floor plan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floor plan group is assigned to a particular system user then the floor plans in that group shall be viewable by that system user.
o. An security management system user holding a "Setup" user role shall be able to create, delete, and edit access control specifications.

21. Threat Levels:
    a. It shall be possible to configure up to eight threat levels. It shall be possible to alter security system behavior through the use of threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.
    b. The security management system shall support 32 threat level groups.
    c. It shall also be possible to change the system threat level in response to an alarm event.
    d. The current system threat level shall display in the title bar of the security application interface and on floor plans.
22. Reports:
    a. The security management system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system. In addition, an easy to use query language shall be included to create ad hoc reports. The query language shall be documented in the online help system. Alternatively, it shall be possible to specify a query by use of point-and-click.
    b. It shall also be possible to produce reports directly from the network controller based on data in archive files on FTP servers, network attached storage, or the controller-attached compact flash.

c. The security management system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.
d. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.
e. Report generation shall not affect the real-time operation of the system.
f. The specific reports provided shall include the following:
    1) Configuration Reports
        a) As Built: A graphical report that displays an image of each Application blade in a node and the specific resources (inputs, outputs, readers, etc.) configured for that blade. The network settings for the node shall also be included.
        b) Cameras: Displays all camera configuration information including control address, IP port, and camera type.
        c) Camera Presets: Displays configured presets for each camera in the system.
        d) Elevators: Displays elevator configuration information including Node, Reader, and Floor to output mappings.
        e) Floor Groups: Displays all configured floor groups for use in elevator control.
        f) Holidays: Displays holiday specification information.
        g) Portals: Displays portal definition information including reader, DSM input, REX input, alarm outputs, and events.
        h) Portal Groups: Displays a list of all defined portal groups.
        i) Reader Groups: Displays defined groups of readers.
        j) Resources: Displays all configured system resources including readers, inputs, outputs, elevators, and temperature points.
        k) Threat Level Groups: Displays all configured threat level groups and the threat levels assigned to them.
        l) Threat Levels: Displays all configured threat levels including the description and color assignment.
    2) History Reports
    3) Access History: Displays access history based on an entered query. The system user can specify the query using either the keyboard or point-and-click selection.
    4) Custom Report: This provides the capability to create custom reports of historical data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.
    5) General Event History: Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.
    6) Portal Access Count: Display how many times users have used a portal.
    7) Audit Trail: Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.
    8) People Reports
        a) Access Levels: Displays all access levels entered into the system including time specification, reader/reader group, and floor group.
        b) Current Users: Displays a list of all security system users currently logged in to the security system website.

c) Custom Report: This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet
d) Occupancy: Displays a list of defined regions with the number of people currently occupying each region and the maximum number of occupants allowed, if a maximum has been specified.
e) Photo ID Gallery: Displays all the photo ID pictures in the system and the person's name.
f) Photo ID Requests: Displays all outstanding badge print requests and lists ID, name, badge layout, activation date, request date.
g) Portal Access: Lists people with access for a selected portal.
h) Roll Call: Allows you to select a defined Region from the drop-down and see a list of people currently in that region.
i) Roster: Displays every person entered into the system and it lists name,
j) ID photo, expiration date, username, and access level.
k) Time Specifications: Displays all defined time specifications currently in the system.

23. Administration: The security management system shall provide for the performance of system administration tasks from any network-connected computer with a browser. Most of the administrative, maintenance, and configuration utilities and functions shall require a security management system user with at least a “Setup” user role. Information from the network administrator shall, in many cases, also be required. These administrative tasks shall include but not be limited to:
    a. Database backups:
        1) The system shall create database, or full system data backups, each night at 00:15 hours. These backups shall be stored in ROM and compact flash onboard the solid-state network controller, and written to the drive on the disk-based controller.
        2) Backups shall also be written to network attached storage (NAS) or an FTP server if such storage has been configured in the system.
        3) It shall also be possible for the system users to create such database backups at any time. Any database backups onboard the network controller may also be downloaded to off board storage by the system user at any time.
    b. System restore:
        1) The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the network controller. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.
        2) It shall be possible to review backups by date and description and select the desired backup for upload to the network controller or restoration as the current system database.
    c. Software updates:
        1) Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these .tgz files. Update of the application software shall only be possible from an update file onboard the network controller. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.

2) Software updates may involve the network controller only or may include updates for the node(s) also. The monitoring of the security system may be unavailable for several minutes during this process.

d. File cleanup: A utility shall be provided to assist in file cleanup. This utility will display for review and deletion all floor plan jpeg files, photo IDs, database backups, badge layouts, and software updates.

e. File upload: The system shall support uploads of files for use in and with the system. Files which shall be uploadable include:
   1) Floorplans in jpg format
   2) Badge layouts
   3) ID photos in jpg format
   4) Database backups
   5) Software license files
   6) software updates
   7) Threat level icons in jpg format
   8) Sound files (.wav) for use in event alerts

f. Setting system time, time zones, and time servers:
   1) The system shall support the setting of time zones by selection off of a drop down pick list. Time zones shall be separately settable for the controller and for each node or MicroNode in the system. An extensive list of world-wide time zones shall be provided. Adjustments for daylight saving time (summer time) shall be automatic.
   2) The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the network controller and its nodes will be regularly synchronized with the exact time used by all other network resources.
   3) It shall also be possible to manually set the system date and time.

g. Changing passwords:
   1) Person data maintained in the system may also contain a user name and password for logging on to the security application website as a system user. The system shall support the changing of administrator passwords. It shall be required to enter the password twice for verification purposes. Passwords may contain neither double-quote (“) nor single-quote (‘) characters.
   2) It shall also be possible to integrate an LDAP server for single-user logon authentication. This will reference the LDAP-stored password for use by the system.

h. Issuing and revoking cards (credentials):
   1) Access cards shall be assignable by the system user either by entering card data directly into the person record or by use of an enrollment reader. Access levels shall be assignable through the user interface by selection from a drop-down list.
   2) Access cards shall be revocable at any time. A system user holding at least the Administer user role may perform this action. Revoked cards shall stop functioning immediately.
   3) Enrolling new people: All person data entered into the system shall be held in the system database and shall be available only to system users holding at least the Administer user role. Person data can be added, deleted, and edited by such system users.
   4) Creating Photo IDs: The system shall include an integrated photo ID function. It shall be possible:
      a) To design badge layouts,
      b) To upload badge layouts for badge printing,
      c) To capture ID photo images, print badges, and delete uploaded badge layouts.

d) For the system user to manage all photo ID functions entirely from within the browser

i. Generating reports:
   1) The system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
   2) Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a pdf file or put into a spreadsheet.
   3) It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.
   4) A system user holding 'Administrator' permissions shall be able to view and create reports.

j. Configuring network resources:
   1) LDAP: It shall be possible to configure an LDAP server for directory services and single-user login. This will reference the LDAP-stored password for use by the system.
   2) DNS: The system shall support setting IP addresses for up to two domain name servers.
   3) email settings: The system shall support the use of email notifications of alarm events. The system user must setup the email server IP address or DNS name and the email address of the network controller. A network administrator must setup the network mail server to relay email for the IP address of the network controller.
   4) File transfer protocol (FTP): The system shall support the use of an FTP Server for backups. Once configured, backups are automatically saved to the FTP server each night.
   5) NAS: The system shall support the use of network attached storage devices for backups. The network administrator must create a domain user account for the network controller and a password. The system user must configure the network attached storage in the system including the domain name, server IP address, share name, and the directory where the network controller may store data.
   6) Time Servers: The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the network controller and its nodes will be regularly synchronized with the exact time used by all other network resources.
   7) A system user holding 'Setup' permissions shall be able to configure network resources.

E. VIDEO MANAGEMENT INTEGRATION
   1. General: The security management system shall support the integration of Digital Video Recorders (DVR) supporting analog video cameras and Network Video Recorders (NVR). This integration shall allow the viewing of live streaming video in the browser interface and recorded video playback. Viewing live streaming video shall require the Java™ 2 Runtime Environment version 1.4.2 or version 5.0.
   2. Events in the alarm subsystem can initiate video recording. Video motion detection, camera up and camera down messages from the VMS can initiate alarms.

3. It shall be possible to monitor DVR and NVR cameras in the same views as IP cameras. VMS events shall be logged in the system activity log. It shall be possible to view recorded video of events from the Activity Log.
4. Integrated DVR/NVR Systems:
   a. Dedicated Micros – DVR DS2 or DV-IP
   b. OnSSI – NetDVMS, NetDVR
   c. exacq – exacqVision
   d. JVC – VR900
   e. Milestone Systems – XProtect Enterprise, XProtect Professional
   f. Panasonic Digital Disk Recorder – WJ-HD309a, WJ-HD316a
g. Vicon – ViconNet
5. OVID: Open Video Interface API:
   a. This specification defines an API to implement the integration of video surveillance systems with the security management system.
   b. The OVID API shall allow users to monitor and control one or more video servers along with their associated video cameras, to augment the physical security devices (door locks, card readers, etc.) controlled by the security management system.
   c. The integrated system shall be controlled through a web browser user interface which presents an integrated view of both the security management system and the video surveillance system.
   d. LDAP: It shall be possible to configure and Active Directory Server with the security management system.
   e. This shall provide single user-login capability.
   f. Password rules and authentication will be governed by the LDAP server.

F. MERCURY HARDWARE INTEGRATION
1. The system shall utilize access control hardware from Mercury Security Corp.
2. The following Mercury hardware components shall work with the controller:
   a. Mercury Panels:
      1) EP2500: Intelligent Controller: 32 MB RAM, Ethernet
      2) EP1502: Intelligent Dual Reader Controller: 16 MB RAM, Ethernet, 2 readers (magnetic stripe or Wiegand) 8 inputs, 4 relays
      3) EP1501: Intelligent Single Door Controller: PoE, single door, 2 readers, 2 inputs, 2 outputs
   b. Mercury Interface Boards (SIOs)::
      1) MR-50 Reader Interface Module: 1 reader (magnetic stripe or Wiegand), 2 inputs, 2 relays
      2) MR-52 Reader Interface Module: 2 readers (magnetic stripe or Wiegand), 8 inputs, 6 relays
      3) MR-16in Input Monitor Module: 16 inputs (zones), 2 relays
      4) MR-16out: Relay Output Control Module: 16 relays

G. REMOTE LOCKSET INTEGRATION
1. The system shall support the integration of ASSA ABLOY Wi-Fi enabled locksets (models vS2 and pS2) with the security management system.
   a. Once a lockset is installed and registered with the controller, it appears in the security application as a “Remote Lockset” node, which can be enabled and configured to work with the controller.
   b. It shall be possible to set configuration options for a remote lockset to change its call-in and lockout behaviors.
   c. It shall be possible to configure the reader and portal that were automatically created for a remote lockset.
   d. It shall be possible to view cached information for a remote lockset, for troubleshooting purposes.

e. It shall be possible to specify special-use formats for access cards to be used with remote locksets.
f. The remote lockset shall be able to send high priority events to the controller.
g. The remote lockset shall update the controller with the current voltage level of its battery upon each connection.
h. It shall be possible to schedule an automatic unlock period for remote-lockset portals. The start of this period can be triggered by time or by an initial valid card read.

H. API INTEGRATION

1. An application programming interface (API) is provided for the security management system. The API provides programmatic access to the network-connected components managed by the security management system.

a. Communication between the security management system and another application takes place through the TCP/IP networking protocol. The API is invoked by POSTing an HTTP message to the web server on the network controller.
b. The security management system database includes a table of “people” whose records act as container objects for attributes attached to people in real life. People are mapped to access levels, which specify access privileges—and to access cards, whose credentials are used for access control.
c. Access levels are entered into the system using the normal web user interface for the security management system. People and credentials may be entered into the system either through the web user interface or through the API.
d. The API supports commands for:
    1) Adding, modifying, removing, and retrieving data about a person, and retrieving information about one or more people based on various search criteria.
    2) Adding, modifying, and removing credentials, and retrieving a list of the names of defined card formats.
    3) Adding, modifying, and deleting access levels, and retrieving a list of the valid access levels in the system.
    4) Pinging the security management system to determine its health, and retrieving the current version of the API from the server.
    5) Retrieving a history of access activity, either for all users or for a particular access card.
    6) Adding, modifying, and removing threat levels and threat level groups, and setting the threat level in the system.
    7) Retrieving a list of portals and associated card readers defined for the security management system.
    8) Adding, modifying, deleting, and retrieving time specifications and time specification groups.
    9) Adding, modifying, and deleting holidays, and returning a list of holiday keys or a specific holiday.
    10) Adding, modifying, deleting readers and reader groups, and returning a list of reader group keys or information for a specific reader group.
    11) Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.
    12) Requesting events from the Activity Log that occurred within a specified time period. These events are returned from the API in the CSV Export report format.

I. CERTIFICATIONS

1. UL 294 listed.
2. ISO 9000 listed.

2.5 BADGING SYSTEM – MAIN SUBSCRIBER WORKSTATION

A. The software shall provide Image Capture, Video Enhancement and File Photo Recall allowing photos of cardholders to be captured electronically using a digital video camera. It shall be possible to digitally store the photo in any bitmap format with the associated cardholder record. It shall be possible to view cardholder's picture from any system workstation if user rights allow. Control buttons and tabs shall provide display of dialogue boxes for feature activation and video capture setup as follows:
   1. Image Capture Button - shall display the video capture menu. This window shall provide for complete setup and preview of selected images and list the file tabs required capturing images. The image capture screen shall provide the user with a Take Picture button for easy system operation. The software shall also provide a preview mode of all photos and allow for continuous or at start-up modes of operations. The user shall also have the capability to Take and incorporate any previewed photo for the same setup screen. The Tabs shall be defined as:
   2. Single Shot Tab - shall allow the user to preview an image from either a digital camera either at start-up or continuous at a rate of an image every 2 seconds. Take Picture Button shall capture the desired image and provide for additional image enhancement screens. The software shall provide image cropping and an Image Enhancement feature as part of the Image Capture module. Enhancement control shall include: contrast, brightness, saturation, hue, sharpness, gamma and RGB color schemes.
   3. Camera Tab – shall allow the operator to access images that are stored in a digital camera. The operator shall have the capability to Load, Refresh, Erase or Cancel any or all images.
   4. Setup Tab – shall allow the operator to: setup communications between the computer and digital camera, set the desired resolution, activate the LCD of the digital camera, set orientation of image, set camera flash, set shutter speed of camera and erase all unwanted stored images.
   5. Info Tab – shall display all camera identification information, pictures in camera system, camera setup, and power indications.
   6. File Capture Button – shall allow the operator to import an image file in any bitmap format from a file or directory external to the picfile.
   7. Delete Button – shall allow the system user to delete the displayed image.
   8. Edit Button – shall allow user to edit the stored image location.

B. The system software shall provide ID badge printing using the same cardholder database as the access system. Systems requiring duplicate data entry shall be unacceptable. The system shall allow the cardholder's picture, once captured, to be merged with graphics and variable data to produce a color or black and white photo ID badge. Utilities within software shall allow the user to select either vertical or horizontal badges of credit card or data collection card sizes, bitmap designs, pictures, fixed or variable database text as part of the badge design. The software shall be capable of producing badges on thermal or PVC media. Printing of badges shall be accomplished from the cardholder record as follows:
   1. Print Button - shall open the card selection window. From this screen, the operator shall have the capability to print all cards from the selected CDF file.
   2. Force Print Button - shall allow the operator to print the badge immediately whether or not the number of badges per sheet of media is filled. The software shall allow selection of which cards shall be printed on a sheet.
   3. Queue Button – shall allow the operator to send a badge design to the buffer to be printed later.

4. Search Tab – shall allow the system operator to search by user defined criteria. A pull-down list shall provide all search parameters and operators for selection by the user. The search tab shall allow the sorting of cardholders by card number or cardholder name. The results of all searches shall be displayed on the lower portion of the display window and shall allow the operator to double left click on the appropriate result line to view the cardholder information. A window shall be located on the main display screen to preview photos of selected cardholders. Old cardholder numbers that have been reassigned, shall be displayed in red until the old record is deleted from the system.
5. Block Tab – shall allow the system operator to add or delete blocks of cards. The display screen shall allow the operator to select the start and stop numbers for any sequence as well as any Time Zone, Reader Groups, expiration dates, relay control and anti-passback functions.
6. Data Page Tab – shall allow the system operator to create, delete or edit custom cardholder information pages. The operator shall have the capability to design a complete page by simply selecting any field from the cardholder table in the database and dropping them on the page. The custom page shall appear as a tabbed page in the cardholder's record.
7. Data Table Tab – shall allow the system operator to add, delete or edit custom data fields in the cardholder table of the system database. The software shall have the ability to rename and resize each field entry and save existing data into the edited field.

C. The system software shall have the capability to design and create individual badge designs. The design module shall allow the system operator to create and save any number of cards by incorporating drag and drop graphical interface. The card design toolbox shall provide the following Control Buttons for designing the badge:
1. Card Type Button – shall allow the user the capability to select the card size, vertical and horizontal starting offsets, and card count for the selected card definition. The design window shall also allow for selecting the location of the magnetic stripe as well as the slot location as a visual aid to the card designer. The software shall also provide the user the capability to select dual sided printing. The system user shall also have the capability to select the card background color, vertical or horizontal card layouts, card rotation, card definitions and preview the design before saving. The software shall allow for on-screen printer selection by a drop-down list that displays all installed print drivers with a minimum of five selectable printers.
2. Pic Button – allows the user to place a picture frame on the badge. It shall be possible to edit the picture parameters by double clicking on the picture with the left mouse button and entering the new criteria. By using the mouse, the user shall have the capability to drag the picture to the desired location on the badge. The user shall have the capability to rotate the image, select the color and width for an inside border around the picture, and adjust the image brightness.
3. Fixed Text Button - shall allow the user to place fixed text that will remain the same on all badges printed with the badge design. It shall be possible to select any font used in Windows for the fixed text insertion. The text, in addition to font style and size, shall be adjustable in font color, location, rotation, and background color. If a background is incorporated, it shall be selectable as transparent or opaque.
4. Variable Text Button – shall allow the user to place text fields from the cardholder's database on the ID badges allowing information entered in the cardholder record to be printed on the card. The appropriate dialogue boxes shall provide selection of the cardholder data field, field length, alignment, and best-fit text. The software shall allow the selection of font type, font style, font size as well as text color, text background and color.

The display window shall provide an add button allowing the user to select field information such as card number, time zones, reader groups, anti-passback, etc, and insert the information automatically on the card. Manual insertion of database information into the variable text fields shall be unacceptable.

5. Bitmap Button - shall allow the user to select different bitmap designs dependant on the setup of on-screen operators. The user shall have the ability to set criteria for all bitmap logic parameters and determine the result of each logical function. The criteria for the bitmap logic inserts shall include, but not be limited to:
   a. Card number
   b. Reader groups
   c. Time zones
   d. Keypads
   e. Pin numbers
   f. Relays
   g. Expiration dates
   h. Anti-passback
   i. Time/date
   j. System activity

D. The user shall have the ability to select the location, area, size, and rotation of the bitmap selected as well as the background color. The system shall provide the operator the ability to use bitmap logic based upon information within the database without use of a programming language, script file language, or any similar type language to accomplish automatic badge view and printing functions. The system shall enable the end-user to easily accomplish badge design(s). The system software shall allow the user to un-select bitmap designs by a simple mouse click.

E. Bar Coding Button – shall allow the user to insert barcodes as part of the card design. Data for each barcode shall be selected from a drop-down list and shall include system database fields, constants or be a combination. The user shall have the capability to select the field length, right-left-no padding as well as the padding characters. The software shall also allow the user to select the position, rotation, ratio, height, size and readability of the barcode string. The system software shall support the following barcodes:
   1. UPCA
   2. UPCE 11 digit
   3. EAN/JAN 8 and 13
   4. Code 39
   5. 2 and 5 digit supplemental
   6. Interleaved 2 of 5
   7. Extended Code 39
   8. Codabar
   9. Code 128 Auto
   10. PostNet
   11. Plessey
   12. Code 93
   13. Extended 93
   14. UCC 128
   15. HIBC
   16. PDF417
   17. UPCE-0
   18. UPCE-1
   19. Code 128 A
   20. Code 128 B
   21. Code 128 C

F. Card Encoding Button – shall allow the user to interface with a PVC printer or computer-driven external encoder. The software shall allow for encoding of up to three tracks or any combination depending on the system.

G. Save Button - shall allow saving the badge design. It shall be possible to save an unlimited number of badge designs. Systems that do not provide multiple badge designs are unacceptable.

H. Display Grid Button – shall allow the user to display a grid in the card design window for alignment of card objects. This design tool shall have a snap-to-grid feature enabling quick alignment. The size and visibility of the grid pattern shall be selected by the user.

I. Open Button - shall allow the system user to choose which badge design will be used for printing.

J. Save Button – shall allow the user to save card designs and assign names using *.cdf formats.

K. Exit Button – shall allow the user to return to the main screen.

L. The software shall support Photo Recall by left clicking on a cardholder event displayed on a transaction screen. Automatic Photo Recall shall provide the operator with a view of cardholder photos in real time as they present their cards to system readers. The cardholder name and reader location shall also be displayed with each photo. The number of picture frames displayed on the screen shall be adjustable by the system operator from a properties menu. The Photo Recall shall automatically display the number of images selected by the user and continue the display on a FIFO basis when the maximum photos are displayed. Filters may be assigned to the Automatic Photo Recall screen to allow selection of the cardholders' pictures that are displayed and for what doors.

M. The system software shall provide the system administrator with the capability to download all system setup parameters and databases to remote system panels. The system administrator shall have the capability to select all or individual parameters to be downloaded as well as the selection of remote panels requiring the download information. The download display windows shall notify the system administrator when download has been completed. The software shall provide for networking capability of remote panels. The software shall provide the ability to communicate with system panels over a data network using either Ethernet or Token Ring data link protocol. The software shall allow the user to perform all of the same functions as that of a hardwired remote panel.

N. The system software shall provide the user with a filters module for filtering information displayed on a transaction screen, printed to a transaction printer and for cardholder images displayed in the Automatic Photo Recall screen. The filters module shall be capable of creating and storing an unlimited number of filters. It shall be possible to construct filters for any or all system events, and to associate the filter with any or all points and point types in the system as required. The system shall still have the capability to record all transactions in the history even if filters are installed.

2.6 SYSTEM REPORTING

A. System report generation shall be available for alarm setup, alarm groups, cardholders, system history, holidays, reader setup, reader groups, relay setup, relay groups, and time zones. The software shall provide the user the capability to print reports to screen or to a local or network printer. When print to screen is selected, the generated report shall have a menu bar that will allow the user to

scroll to the next or a previous page, go directly to the first or last page, print the report, export the report in a selectable format and destination, and zoom on the report page. The cardholder and history reports shall provide the user with the ability to select and or modify search filters for customized reports. The system report window shall have the following selectable reports:

1. Alarm Setup – shall allow the user to view on the screen or print setup of selected alarm inputs listed by computer, port, panel, and point name where the alarm point is connected. The report shall also specify the shunt time, assigned time zone, point reporting, links, and any sound or graphic files that are linked to the point.
2. Alarm Groups – shall allow the user to view or print all alarm groups enabled on the system. The groups shall be sorted by group name in alphabetical order and list the computer, port, panel and points in each group. Any time zone assignment made to a group shall also be displayed. The report shall aid the user in determining the overall system software setup.
3. Cardholder – shall allow the user to select individual fields incorporated within the cardholder record as search filters to conduct a search and print either on screen or to a printer all information found in the search. The user also has the ability to sort this information in either ascending or descending order. The cardholder report window must have the capability to select filters in order to customize the report to meet the user needs. The filters shall include, but not be limited to, reporting fields consisting of: card number, expiration dates, active or inactive status, time zones, reader groups, picture files, relays, and cardholder names. The filter search SQL shall allow the user to select the search operator and the field value. The filter search shall also include anti-passback information and the user shall be allowed to incorporate customized fields in the search parameters. The software shall allow the user to save selected SQL's in memory for easy recall. The user shall have the capability to combine multiple search statements to provide a final selected report.
4. History – shall allow the user to search the history files of all events and produce a report either on-screen or to a printer. The user shall have the capability to customize the history report by the filters located in drop-down lists. The filters described for a customized search shall include:
5. Time and date – shall allow the user to select the starting and stopping time and date for a single search. The user shall also have the capability to select the start, stop times for a single day search or the start, and stop times for a multi-day search report.
6. Search filters – shall allow the user to limit the search to specified parameters. The search SQL shall allow the user to select the search operator and the field value for each search and save the SQL for easy recall. It shall be possible to construct unlimited multiple criteria SQL statements for precise report results. Systems not capable of constructing unlimited multiple criteria SQL statements shall be unacceptable. The report shall allow the user to select and incorporate transactions, readers, alarms, and relay points in the search.
7. Record sorting – shall allow the user to select the order of the report fields and determine the report in either ascending or descending order. The program shall allow the user to select any or all of the filters and to sort in any order using Date, Time, Card Number, or Cardholder.

B. The software shall provide the user with the ability to archive all history reports. The system shall provide a drop-down calendar for selection of month, day and year.

C. Holidays– shall allow the user to view or print all holidays enabled on the system. The holiday number, date and holiday name shall appear on the report.

D. Reader Setup – shall allow the user to view or print the programming setup of all active readers. The user shall have the capability to select individual or all readers to customize the report. The computer, port, panel, and reader names shall also be included in the report.

E. Reader Groups – shall allow the user to view or print all reader groups enabled on the system. The group reports shall be sorted by group name in alphabetical order and list the computer, port, and panel for each group. The report shall offer the user a detailed description for each reader and its function in the system software.

F. Relay Setup – shall allow the user to view or print the programming setup of all enabled relays on the system. The relays shall be sorted by computer, port, and panel and listed in alphabetical order. The relay name, time zone, pulse time, link relay, link action and first card unlock shall also be included in this report.

G. Relay Groups – shall allow the user to view or print all enable relay groups on the system. The groups shall be sorted by group name in alphabetical order and list the computer, port, and panel for each group.

H. Time Zone – shall allow the operator to print or view all time zones enabled on the system. The report shall list the time zone ID and name as well as the start and stop time, days of operations, and if holiday operation is in effect. The reports shall also list if the zone is linked to another time zone.

I. The system software shall provide the capability to archive system event history and run reports on archived files. The history management module shall display the date and time of the newest and oldest events in the history file and the ability to select the first and last event to be archived. It shall be possible to delete the events from the history file as the archive is performed, freeing up hard drive space for storage of new system activity. The desired storage location shall be entered as a data path in the file field. An Archive Reports Module shall provide the ability to select the desired data source of archived history and structure a report exactly as the system history report module provides.

J. The software shall have the ability to print all individual transactions in real time to any locally connected printer. The software shall allow the system operator to select any transaction filter that is set in the system and apply it to the transaction print. The operator shall be able to set the column width for date, time, cardholder, point, panel, and transaction.

K. The system software shall supply an on-line help menu to the user. The help files shall be available from the main menu and shall include information for all operation and setup system procedures. The user shall have the capability to print any of the help files for later review.

2.7 PROXIMITY ENTRY DEVICE (CARD READERS)

A. Card readers shall be Essex Electronics RoxProx series wall or frame mounted to standard single gang electrical boxes. Provide readers with standard Wiegand output where indicated on the Drawings.

2.8 PROXIMITY CARDS

A. The card shall be capable of having individual photo identification, multi-color custom graphics and permanently marked numbers printed directly onto both sides. The card shall be made of robust ABS plastic to provide maximum protection for the circuitry inside and provide minimal flexing which could cause damage to the card.

B. Standard cards provided for this project shall be equivalent to HID Corporation, ProxCard II, and shall incorporate the following features:
   1. Cards shall be provided in a standard credit card (CR-80) Size.
   2. With the specified Standard Proximity Card Reader Heads, the read range associated with this type of card shall be approximately 3-8 inches.
   3. Cards shall be blank on both sides, except for the card number, printed on the card.
   4. Numbering sequence shall be 0001 to 0100. A site code, providing added security against a duplicate card number from a cardholder of another system gaining access, shall be assigned by the manufacturer and included in the numbering scheme of all cards.
   5. The manufacturer shall pre-encode each card with an industry-standard, 26-Bit, non-proprietary format, and shall permanently print the pre-encoded number on each card. The number printed on the card shall match the factory-encoded proximity number. The site code shall not appear on the card. Conversion charts, which match the encoded number with the printed number, shall be unacceptable.
   6. Cards shall operate properly, within the range of -50° F to 160° F (-45° C to 70° C).

C. Prior to ordering/shipping the devices, the Contractor shall discuss the various options and desired printed card format(s), including those which are available but are not listed in this specification, with the Owner. If any custom artwork, other features, or accessories (clips, card pouches, straps, lanyards, etc.) are to be provided with the cards, a price for the addition of such added features shall be provided.

D. Provide a total of 200 cards.

2.9 PROXIMITIY KEYFOBS

A. The keyfob shall be constructed of an ultrasonically welded ABS plastic shell and require no battery for operation, supports format to 85 bits with over 137 billion codes.

B. Keyfobs provided for this project shall be equivalent to HID Corporation Proxkey II 1350.

C. Provide 200 keyfobs.

2.10 EXIT DEVICES

A. REX LOCKS
   1. Selected doors as scheduled to be card access entry/free-exiting shall be provided with REX switches built into the door hardware. Refer to security control point schedules and wiring diagrams on the drawings.

B. DOOR RELEASE PUSHBUTTONS
   1. Provide momentary contact pushbutton mounted below counter or desktop as shown on the drawings. Provide Potter Cat. No. HUB-T surface mounted pushbutton switch. Feed from flush box mounted at 18” AFF with #18/2 conductor cable attached to bottom of counter or desktop with cable supports and tye-wraps.

C. EXIT PUSHBAR DEVICES
   1. Push bar exit devices and electric hinges are provided by builder’s hardware supplier. SS Contractor is to interface to card access system for legal release of door lock. These devices include an electric door hinge for

routing of signal switch from exit push bar to controller. These door locations will receive power from local power supplies provided with the door hardware.

2.11 DOOR CONTROL POWER SUPPLIES

A. Provide centralized power supplies where indicated on the drawings for electric locks and strikes. Power supplies shall have the following:
   1. NEMA 1 enclosure with hinged and lockable cover.
   2. Master on/off input power switch.
   3. 120VAC input and 24VDC secondary output rated at 10 ampere.
   4. Output shall have a maximum voltage fluctuation of +/- 10%.
   5. Sixteen individual power outputs. Each with a resettable circuit breaker or replaceable fuse and surge protection shall individually protect each electric lock output.

B. Centralized power supplies shall be as manufactured by AlarmSaf or Altronix.

2.12 ACCESS CARD DEVELOPMENT SYSTEM

A. A complete photo access card development system shall be provided. This system shall allow for the production of photo access cards at the facility. The system shall be provided with the following:

B. PRINTER
   1. The printer shall be capable of producing multicolor identification cards on PVC or polyester card media. The printer shall be capable of printing in three colors (yellow, magenta, cyan (YMC)), four colors (yellow, magenta, cyan, black (YMCK)) and/or four colors with overlay capabilities (YMCKO). The resolution shall be 300 dpi (11.8 dots/mm), and the printer shall be capable of edge-to-edge printing. The dual printer feed hoppers shall be able to accommodate a total of 200 card blanks of 0.030-inch (0.762-mm) thickness. The printer shall be able to print on plain plastic blanks, on card media incorporating a magnetic stripe or smart cards that meet standard chip-position requirements. The printer shall also permit the application of a clear or holographic overlaminate onto the card as part of the printing process.
   2. The printer shall include the following security features:
      a. Capability of printing a transparent security image viewable only under certain conditions onto the printed cards
      b. Ability to restrict access to the printer by requiring that a custom access card be inserted into the printer for the printer to operate
      c. Lockable card feed hopper
   3. It shall be possible to connect the printer to the controlling PC via a parallel input, IEEE 1284-compliant interface; an optional serial interface; or an optional USB interface.
   4. The printer shall be a Fargo DTC515-LC Direct-To-Card Card Printer with Card Lamination Module or approved equal.

C. DIGITAL CAMERA AND TRIPOD
   1. Canon A-80 or equal by Pentax or Nikon.
   2. Provide a portable tripod equal to a Slik Cat. No. SDV-30 3-Way panhead photo/video tripod with quick release shoe.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate relay configuration required to perform the operations as described in Specification Section 28 50 10 with the locks provided in Section 08 70 00 – Finish Hardware (Builder's Hardware) and Section 11 19 75 - Detention Equipment Hardware.

B. Review details on the drawings for card readers to be recessed in the walls for locations vulnerable to cart traffic.

3.2 INSTALLATION

A. The Division 26 Electrical Contractor shall make all necessary wiring connections to external devices and equipment.

3.3 WIRING

A. All wiring to be in conduit. Verify the exact wiring requirements necessary for the actual equipment being supplied. Wiring specified and shown on drawings is for minimum bidding purposes only.

B. Reader: Twisted, shielded 22 AWG (6 conductor) Maximum distance: 500 feet (152 meters).

C. Inputs (Door Contact & REX) : Twisted, shielded 22 AWG Maximum distance: 2000 feet (610 meters).

D. Outputs (Locking Mechanism): Twisted, shielded 22 AWG Maximum distance: 2000 feet (610 meters). Outputs support any output devices that operate on the following maximum electrical ratings: 30 Volts DC or AC, 2.5 Amps inductive or 5.0 Amps non-inductive.

E. Cabling between control panels and from control panel to system communications fiber optic converter shall be Cat 6. Maximum length shall not exceed 300 feet.

F. Cables by Belden or Alpha are acceptable.

3.4 ON-SITE COMMISSIONING

A. The manufacturer shall provide direct participation in the On-Site Commissioning (OSC) activity of the new system, in conjunction with the SS Contractor. The OSC will provide for initial programming of all users.

B. The OSC shall provide the SS Contractor with the manufacturer's expertise on installing, configuring and commissioning the system to the customer's specific requirements; and to provide on-site training on system operation and administration.

C. On-site factory training shall be available for system administrators, operators and other qualified personnel.

D. The OSC shall include the following:
   1. Hardware set-up and test.
   2. Communication configuration and test.

3. Preventative maintenance and troubleshooting training for the systems integrator.
4. End-user training.
5. Database configuration and build assistance.
6. Access Card production training.

E. SS contractor Assisted Preparation:
1. Data Requirements.
2. Operators & privileges.
3. Access Hardware.
4. Sensors.
5. Monitor Points.
6. Keyholders.
7. Keyholders security codes.
8. Maps.
9. Prepare room for system installation.
10. Receive equipment.

F. System Installation:
1. Install security management hardware.
2. Factory and dealer On-Site Commissioning.
3. Initial startup and verification.
4. Data Entry.
5. Data Entry listing & verification.

G. Verify Installation:
1. Connect access control hardware to security management system.
2. Download data and verify correct operation.
3. Testing total access and management system.
4. Sample Reports.
5. Daily Operation and Monitoring.
6. Dealer deliver “as built” drawings.

3.5 DOCUMENTATION

A. Accurate “as built” drawings shall be furnished by the SEC Contractor to aid the owner in programming. These should indicate the door(s) controlled by each lock output; the monitoring points for the door controlled area, and any relay outputs or special inputs into the system.

B. The SEC Contractor shall supply operating and maintenance manuals to aid the owner in the programming of the system.

END OF SECTION

SECTION 28 46 50
DURESS ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This system interfaces with the security control system to perform the designed functions utilizing inputs and outputs of the PLC's.

B. All equipment described in this section shall be provided by the SEC Contractor as described in Section 28 46 00.

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 10 – Security System Control and Monitoring

D. Section 28 46 20 – Security System Network Switches

E. Section 28 46 30 –Voice Communication System

F. Section 28 46 40 – Card Access System

G. Section 28 46 60 – Video Surveillance System

1.3 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:
   1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION – JAIL DURESS ALARMS

A. The duress alarm system consists of the following:
   1. Hardwired wall mounted pushbuttons.
   2. Hardwired and concealed below counter or desk mounted pushbuttons.

B. Duress alarms are monitored directly to the PLC in the jail and alarm at the touch screen control stations in the jail. Annunciation of these alarms occurs as alarming icons on the security touch screens at the local security stations and central control. Each location shall be individually depicted on the touch screens. All actions shall be recorded on the SS system.

2.2 NON-JAIL DURESS ALARMS

A. These duress alarms are monitored directly to the card access system specified in Section 28 46 40 – Card Access System. Annunciation of these alarms occurs at all card access workstation locations). See Specification Section 28 46 40.

B. Refer to drawings for locations and system riser diagrams.

2.3 HARDWIRED DEVICES

A. Wall mounted – Basis of Design - Allen-Bradley 800T illuminated red mushroom head, momentary contact switch, mounted to a single gang, 12 gauge stainless steel cover plate. When the switch is depressed the internal light shall illuminate indicating to the operator that the signal has been received at the alarming station. This signal shall be an output from the PLC and not a function of the wring at the switch.

Desk mounted – Basis of Design - Sentrol No. 3045.

2.4 SPARE PARTS

A. Provide the following spare parts:
1. 1 wall mounted device.
2. 1 concealed desktop type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. For hardwired devices at desk locations, provide a single gang box mounted at 18" AFF with 3/8" center hole coverplate and allow 6' of flexible connection to underside of desk. Use cable tie base fasteners screwed to the walls and underside of the counter or desk. See drawings for detail. Verify exact placement at desks and counters with Owner.

B. All devices shall be attached with security screws in compliance with Section 11 20 00 Security Screws.

3.2 WIRING

A. Refer to the drawings for wiring requirements.

3.3 IDENTIFICATION

A. Identify wiring at both ends with adhesive labels.

3.4 TESTING

A. Test operation of each device and receiver location for correct operation.

END OF SECTION

SECTION 28 46 60
VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section describes the products and execution requirements relating to furnishing and installing a complete Video Surveillance System (VSS). The VSS shall be inclusive of all related sub-systems required to provide the storage, monitoring and transport of the images/data acquired from the cameras located with the Rock County Juvenile Detention Center. Active and passive equipment shall be provided as required to complete the system.

B. The SEC as described in Section 28 46 00 shall provide all work and equipment described in this Section.

C. Applicable provisions of Division 01 shall govern the Work of this Section.

D. SEC Contractor is to provide and install a complete and working VSS. All equipment, cables and related hardware shall be furnished, installed, tested, labeled, and documented by the SEC Contractor, as detailed in the following sections.

E. The SEC Contractor shall furnish all materials, labor and any engineering services necessary to provide complete and professionally installed systems in excellent working order as described herein. Laborers shall be specialized and experienced in security installations of type and size described in the Contract Documents.

F. This installation shall provide cameras, monitors and equipment at the locations indicated on the Drawings, and as required for a fully functional VSS. All associated cabling must be provided and included in the SEC Contractor's proposal. The Drawings provided show the design intent and are to be used as a guide for installation.

G. The SEC Contractor shall provide any additional items not specifically mentioned herein, necessary to meet system requirements as specified, without claim for additional payment. Such items may include hardware, transformers, control modules, and other devices for proper installation, interface, integration, and functionality.

H. Basic Electrical Requirements are applicable to all Division 28 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

I. Basic System Requirements;
   1. H.264 for Live Viewing and Recording
   2. 720p Resolution – Digital Cameras
   3. 4CIF Resolution – Analog Cameras
   4. Camera Live View at 30 ips
   5. Recorded Video at 15 ips
   6. NVR shall Record Video 24/7 for 90 Days
   7. NVR shall have Raid 5 for Recovery Hard Drive Loss

1.2 RELATED WORK

A. Section 28 05 20 – Security System Equipment Racks and Enclosures

B. Section 28 46 00 - Security System General Requirements

C. Section 28 46 10 – Security System Control and Monitoring

D. Section 28 46 20 – Security System Network Switches

E. Section 28 46 30 –Voice Communication System

F. Section 28 46 40 – Card Access System

G. Section 28 46 50 – Duress Alarm System

1.3 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable standards are as follows:
   1. ANSI/IEEE C2 - National Electrical Safety Code
   2. NFPA 70-2005 - National Electrical Code
   3. IEEE 802.3 Standards for Ethernet

1.4 WORK SEQUENCE

A. During the construction period, coordinate schedule and operations with Rock County Human Services, Rock County General Services, and the A/E.

B. For additional information pertaining to the sequencing of the work refer to Article 13 of the General Conditions.

C. Installation shall be sequenced to accommodate the Owner's occupancy requirements. See Division 01, General Conditions (Work Sequence).

1.5 SUBMITTALS

A. Prepare submittals in accord with the requirements of specification Section 28 46 00 and include the following information:
   1. Manufacturers catalog specification cuts and printed descriptive literature on all components outlined in this specification. Each component shall be clearly identified with options marked or highlighted.

1.6 PROJECT RECORD DOCUMENTS

A. Submit and record documents per the requirements of Div. 01.

B. Accurately record exact sizes, locations and quantities of equipment.

1.7 QUALITY ASSURANCE

A. The manufacturer shall be a company specializing in IP Video equipment with a minimum of 5 years documented experience in producing IP Video equipment similar to those specified below.

B. Installer Qualifications:

1. The Video Surveillance System Installer shall be licensed and shall meet all applicable regulations. The SEC shall be a firm normally employed in the low voltage and video cabling industry.
2. The SEC must be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels.
3. The SEC shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein. Each Contractor shall furnish with their submittal, a letter from the manufacturer indicating they are a dealer in good standing.
4. The SEC shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of video surveillance distribution systems and have personnel who are adequately trained in the use of such tools and equipment. A resume of qualifications shall be submitted with the SEC Contractor's proposal indicating the following:
    a. A list of five recently completed projects using the product proposed of similar type and size with contact names and telephone numbers for each.
    b. A list of test equipment proposed for use in verifying the installed integrity of metallic cable systems on this project.
    c. A technical resume of experience for the SEC Contractor's Project Manager and on-site installation supervisor who shall be assigned to this project.
    d. A list of technical product training attended by the SEC Contractor's personnel that shall install the video surveillance system shall be submitted.
    e. Any subcontractor who shall assist the SEC in performance of this work shall have the same training and certification as the SEC Contractor.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products to and receive products at the site under provisions of Division 01, General Requirements.

1.9 DRAWINGS

A. It shall be understood that the VSS details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the SEC Contractor in bidding the job. The Contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The SEC shall verify all conditions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the SEC shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted, within 10 days prior to the bid due date.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Refer to the Camera Schedule and VSS configuration diagrams shown on the drawings.

B. Operator controls shall consist of desktop keypad controllers with common control of cameras as scheduled via touchpad call-up, joystick operation of pan/tilt and spring return switches for iris, zoom and focus.

C. Master Control will consist of dual operator touch screen control stations each identical in regards to video monitoring and control.

2.2 AUTOMATIC INTERCOM CALL-UP AND SECURITY SYSTEM INTERFACE

A. Refer to the security control point schedule, camera schedule and configuration diagram on the drawings for doors/intercoms that are to be interfaced to the VSS system. This interface shall be via software interface between the Security System and the Virtual Matrix Server. Cameras interface to intercom call-up shall output to the scheduled monitors or monitor segment upon actuation of the intercom call select icon.

B. Automatic call-up of cameras to selected monitors shall be accomplished through the interfacing of the Security System PLC to the VSS system. The Security System PLC shall provide selected outputs to the VSS system identifying which camera/s; position and monitor are to be selected based on PLC inputs. Camera and monitor schedules for selected PLC inputs (i.e. intercom calls) shall be inherent to the PLC programming and not the VSS system.

C. PC-CC and PC-BK shall operate independent of each other and shall have separate video call and audio interface at each location. These controls stations shall not operate parallel in regards to intercom call and video call-up.

2.3 TOUCH SCREEN CALL-UP

A. Multiplexed monitors shall be interfaced to PLC outputs to the multiplexer alarm inputs to call cameras to full screen when the camera icon is selected on the touch screen. The camera will appear on the monitor associated with the camera to full screen and remain until the icon is deselected which will return the monitor view to multiplexed.

2.4 PRESET POSITIONING

A. Refer to the camera schedule on the drawings. Selected cameras are to be programmed for preset positioning in response to an intercom call selection or door alarm.

B. Where cameras are scheduled to preset position to the listed location, the cameras shall automatically pan/tilt/zoom to the location and latch until called up for manual control or by reset and acknowledge of the intercom call or door alarm. Cameras shall return to a default position to be selected by the Owner. Coordinate with the Owner for the selected default view.

2.5 NVR ARCHIVING SERVER (RACK MOUNTED)

A. Manufacturers
   1. Intransa
   2. Supermicro
   3. HP
   4. Dell
   5. Pivot3

B. Minimum Requirements:
   1. 6 Core Intel® Xeon® Processor 2.66 GHz, 16MB cache with 128Gb of RAM
   2. Two (2) serial ports.
   3. 10/100/1000 MBPS Ethernet NIC.

4. Hard disks sized as required in conjunction with additional NVR Archiving modular storage expansion units as required for the storage of up to 64 cameras at 15fps with a 4CIF 704x576 resolution for 30 days per camera input plus 25% expansion per unit.
5. License agreement for all applicable software.
6. Redundancy
    a. The unit shall support a fault tolerant hard drive and redundant database architecture through the utilization of a Redundant Array of Independent Disks (RAID). It shall allow for normal operations with minimal downtime to occur in the event that the database server fails.
    b. The Contractor shall furnish and install a level 5 SCSI RAID, hot swappable. The RAID unit shall provide data striping at the byte level and also stripe error correction information with excellent performance and good fault tolerance. The Contractor shall supply hard drives where required via SCSI format.
    c. The system shall support a redundant array of multiple independent hard disk drives RAID that provide high performance and fault tolerance. The RAID array shall appear to the host computer as a single storage unit.
    d. RAID level 5 includes disk striping at the block level and parity. The administrator shall be able to replace the failed drive without taking the security system down. The array software shall rebuild the lost data from parity information stored on the other drives in the array.
    e. Provide RAID management software for physical and logical supervision of the RAID Subsystem. The RAID management software shall, at a minimum, report logical disk errors, Physical disk errors, Power supply failures, over temperature, SCSI interface failure.
7. Clone computers built by the Contractor shall not be acceptable. Computers shall be fully compatible and endorsed by Video Management Software provider.
8. NVR to Record Video 24/7 for 30 days.
9. NVR shall have Raid 5 for Recovery after hard drive loss
10. Camera Live View at 30 ips
11. Camera Recorded Video at 15 ips on motion only.

2.6 NVR ARCHIVING MODULAR STORAGE EXPANSION (RACK MOUNTED)

A. Manufacturers:
1. Intransa
2. Supermicro
3. HP
4. Dell

B. Minimum Requirements:
1. Capacity as required for SAS hot swappable hard disks sized as required in conjunction with NVR Archiving Server units as required for the storage of up to 64 cameras at 15fps with a 720p 1280x720 digital resolution (4CIF 704x576 analog resolution) for 90 days per camera input plus 25% expansion per unit.
2. The NVR shall be sized to accommodate 90 days of usable (not net) storage at 720P (1280x720), 15FPS, using a data rate of 2300kbps assuming 50% motion. For PTZ cameras operating at 4CIF (704x480) the assumptions should be 800kbps, 15fps, using a data rate of 800kbps assuming 50% motion."
3. License agreement for all applicable software.
4. Redundancy
    a. The unit shall support a fault tolerant hard drive and redundant database architecture through the utilization of a Redundant Array of Independent Disks (RAID). It shall allow for normal operations with minimal downtime to occur in the event that the database server fails.
    b. The Contractor shall furnish and install a level 5 SCSI RAID, hot swappable. The RAID unit shall provide data striping at the byte level and

also stripe error correction information with excellent performance and good fault tolerance. The Contractor shall supply hard drives where required via SCSI format.

c. The system shall support a redundant array of multiple independent hard disk drives RAID that provide high performance and fault tolerance. The RAID array shall appear to the host computer as a single storage unit.

d. RAID level 5 includes disk striping at the block level and parity. The administrator shall be able to replace the failed drive without taking the security system down. The array software shall rebuild the lost data from parity information stored on the other drives in the array.

e. Provide RAID management software for physical and logical supervision of the RAID Subsystem. The RAID management software shall, at a minimum, report logical disk errors, Physical disk errors, Power supply failures, over temperature, SCSI interface failure.

5. Clone computers built by the Contractor shall not be acceptable. Computers shall be fully compatible and endorsed by Video Management Software provider.

2.7 NVR VIDEO MANAGEMENT SERVER (RACK MOUNTED)

A. Manufacturers:
1. Intransa
2. Supermicro
3. HP
4. Dell

B. Minimum Requirements:
1. 6 Core Intel® Xeon® Processor 2.66 GHz, 16MB cache with 128Gb of RAM
2. Two (2) serial ports.
3. 10/100/1000 MBPS Ethernet NIC.
4. One (1) TB hard disk.
5. License agreement for all applicable software.
6. Redundancy
   a. The unit shall support a fault tolerant hard drive and redundant database architecture through the utilization of a Redundant Array of Independent Disks (RAID). It shall allow for normal operations with minimal downtime to occur in the event that the database server fails.
   b. The Contractor shall furnish and install a level 5 SCSI RAID, hot swappable. The RAID unit shall provide data striping at the byte level and also stripe error correction information with excellent performance and good fault tolerance. The Contractor shall supply hard drives where required via SCSI format.
   c. The system shall support a redundant array of multiple independent hard disk drives RAID that provide high performance and fault tolerance. The RAID array shall appear to the host computer as a single storage unit.
   d. RAID level 5 includes disk striping at the block level and parity. The administrator shall be able to replace the failed drive without taking the security system down. The array software shall rebuild the lost data from parity information stored on the other drives in the array.
   e. Provide RAID management software for physical and logical supervision of the RAID Subsystem. The RAID management software shall, at a minimum, report logical disk errors, Physical disk errors, Power supply failures, over temperature, SCSI interface failure.
7. Clone computers built by the Contractor shall not be acceptable. Computers shall be fully compatible and endorsed by Video Management Software provider.

2.8 POE POWER INJECTOR

A. Manufacturers:

1. Veracity
2. Pelco
3. Or Approved Equal

B. Minimum Requirements:
1. The device shall meet the demanding data rate and power requirements of the attached IP cameras with high-quality streaming video capabilities.
2. The device shall meet the IEEE 802.3af standard for detection, connection, disconnection, and fault protection.
3. The device shall be compatible with 10/100Base-T systems and systems up to 1000 Mbps.

2.9 ETHERNET OVER COAX CONVERTER

A. Manufacturers:
1. Veracity
2. Gefen
3. Or Approved Equal

B. Minimum requirements:
1. The device shall Supports up to 200 Mbps data transmission rate.
2. Rj-45 port
3. Coaxial port

2.10 VIDEO MANAGEMENT SOFTWARE

A. Manufacturers
1. Genetec
2. No Equal

B. Minimum Requirements:
1. Latest version of associated software required for a fully functional system.
2. The VMS shall allow for failover of cameras in the event of the failure of a NVR Archiving Server.

2.11 DVI ENCODER DECODER

A. Manufacturers:
1. Contec
2. Or Approved Equal

B. Minimum Requirements:
1. The Display Graphics Distribution System transmitter shall convert the VGA input image signals into LAN packet signals before transmitting them.
2. The Display Graphics Distribution System receiver shall convert received LAN packets into VGA image signals in order to transfer them to the monitor(s).
3. Receiver and transmitter units shall utilize static IP address.

2.12 ANALOG TO IP ENCODER

A. Manufacturers:
1. Axis
2. Bosch
3. Mango
4. Verint

B. Minimum requirements:

1. H.264 compression at 4CIF on all streams.
2. Multicasting or dual stream to achieve 30fps for live view and simultaneous 15fps for recording per input
3. 8 to 16 coaxial ports
4. Auto-sensing 10/100/1000 Base-T connector (RJ45)
5. The DVS shall support the following IP protocols: RTP/IP, UDP/IP, TCP/IP, multicast IP, DNS, NTP, HTTP, HTTPS and DHCP client.
6. Interface support for attached PTZ cameras to allow full control via Video Management Software
7. Fully compatible with Video Management Software.

2.13 REMOTE VIEWING STATION (RACK MOUNTED)

A. Manufacturers:
1. HP
2. Dell
3. Or Approved Equal

B. Minimum Requirements:
1. 3.33 GHz processor with 4GB of RAM.
2. Two (2) serial ports.
3. 10/100/1000 MBPS Ethernet NIC.
4. DVD/CD-read/write drive.
5. One hundred and twenty (120) GB hard disk.
6. License agreement for all applicable software.
7. Two dual head video cards to accommodate 4 monitors with VGA output connectors.

C. Video Management client software shall be installed on the unit.

D. Clone computers built by the Contractor shall not be acceptable. Computers shall be fully compatible and endorsed by Video Management Software provider.

E. Provide patch cords as required for network connection to local switch, video VGA, mouse and keyboard.

2.14 REMOTE WORKSTATION

A. Manufacturers:
1. HP
2. Dell
3. Or Approved Equal

B. Minimum requirements:
1. 3.33 GHz processor with 16GB of RAM.
2. Two (2) serial ports.
3. 10/100/1000 MBPS Ethernet NIC.
4. DVD/CD-read/write drive.
5. 1TB hard disk storage
   a. Up to (3) 2.5 inch SATA solid state drives 0.9TB
6. License agreement for all applicable software.
7. Video card with VGA, HDMI, DVI output connector
   a. 1GB – PCI Express 2.0 x 16 low profile DVI
8. Mouse.
9. Full function keyboard.
10. Audio sound card and speakers.

C. Video surveillance client software shall be installed on the unit.

D. Clone computers built by the Contractor shall not be acceptable. Computers shall be fully compatible and endorsed by the Video Management Software provider.

E. Provide patch cords as required for network connection to local switch, video VGA, mouse and keyboard.

2.15 MONITORS

A. Color flat panel TFT/LCD monitor with swivel base for horizontal and vertical viewing adjustment, on screen display for setup and adjustment of monitor parameters and built-in power supply. The monitors shall have a protective glass filter.

B. MONITOR (size as scheduled)

1.	Viewable image size:	19” or 42” (nominal)
2.	Contract ratio:	700:1
3.	Pixel Pitch:	0.294mm
4.	Interface:	Analog
5.	Resolution:	SXGA 1280 X 1024
6.	Brightness:	300cd/m2
7.	Display Colors:	16.7 million
8.	Response Time:	8ms
9.	Viewing angle:	120H X 110V

C. Monitors shall be similar to AGN/PRO SX-19A, NEC MultiSync LCD1970NX, or Planar PE-2010.

D. SEC to provide monitors with HDMI input for direct interface with Panasonic WJ-GXD400 Video Decoders.

2.16 MONITOR MOUNTS

A. Column Mounted

1. Refer to detail 3/SE4.1 on the drawings. The mounting column shall be constructed of extruded aluminum with anodized natural finish and built-in removable rubber inserts for concealing cable within the column. The multi-panel bracket shall be infinitely adjustable up or down the length of the column for two 19” monitors for each column. Flat panels shall attached to the column using universal wall mounting plate with VESA 75mm or 100mm hole spacing . Mounts shall be adjustable for +/-25 degree tilt and +/-90 degree rotation. The mounts shall be Chief KTG230 series with two flat panel brackets.

B. Pedestal Mounted

1. Manufacturers
   a. Peerless LCH-100
   b. or approved equal
2. Side to side swivel restricted to +/- 45°or less
3. 50°upward and 30°downward tilt
4. Height adjustable from 12.3” to 16.3”
5. Desired tilt angle can be locked in place if needed.

C. Wall Mounted

1. Manufacturers
   a. Peerless ST635 Series
   b. or approved equal
2. Universal mount for 42” flat screen
3. One touch tilt allows tilt adjustment of +/- 5°to 15°without the use of tools
4. Desired tilt angle can be locked in place if needed.

2.17 KEYPAD CONTROLLERS

A. Manufacturers:
   1. Axis
   2. Bosch
   3. Pelco

B. Controller shall consist of a keyboard base with jog shuttle and recorder controls and a separate 3D joystick that can be located on either side of the keyboard. The joystick shall permit single hand control of Pan, Tilt, Zoom, Focus and Iris adjustments.

C. The controller shall require a user ID and password to be entered in order to be operated and shall restrict the functions available based on the privileges of the user ID and password entered.

D. The controller shall communicate with a 10/100BASE-T Ethernet connection.

2.18 FIXED DOME IP CAMERA

A. Manufacturers:
   1. Axis
   2. Bosch
   3. Pelco
   4. Samsung
   5. Sony
   6. Panasonic

B. Minimum Requirements:
   1. H.264 Compression at 720P (1280x720) on all streams
   2. Multicast or dual stream to achieve 30fps for live view and simultaneous 15fps for recording
   3. Minimum Illumination (3200K, scene reflectivity 89%, F1.2) at 30 IRE of 0.017lx in color and .0057lx in monochrome with no frame integration
   4. 1/3" CMOS HD Sensor
   5. Vari-focal motorized zoom/focus lens, 3-9mm
   6. 84dB Dynamic Range
   7. Automatic and Manual White Balance
   8. Automatic Gain Control (AGC)
   9. Backlight Compensation
   10. Electronic Shutter operating in the range of 1/30 and 1/150,000 second
   11. The camera shall support both fixed IP addresses and dynamically assigned IP addresses
   12. Provide the ability to control network traffic by limiting the maximum bandwidth to a selected value
   13. Support Quality of Service (QoS) to be able to prioritize traffic
   14. The camera shall be equipped with one 100BASE-TX Fast Ethernet port, using a standard RJ-45 socket and shall support auto sensing of network speed.
   15. Manufactured with an all-metal vandal resistant body and clear vandal resistant dome.
   16. Camera and dome must have an IK10 impact resistance
   17. Optional "smoke" or tinted vandal resistant cover (IK10)
   18. IP66 and NEMA4 rating
   19. Thermostatically operated heater with selectable on/off.
   20. The camera enclosure shall provide the ability to adjust the camera modules angle with at least +/- 180 degree horizontal, +/- 90 degree vertical, and +/-180 degree rotation wile maintaining an image that is not interfered with by the camera housing.
   21. Power over Ethernet according to IEEE 802.3AF for indoor or outdoor use.

22. Maximum 7.2 Watts.
23. Temperature rating –4 to 113 degrees F (-50C to 50C)
24. Temperature rating:
25. SDXC or SDHC microSD card compatibility
26. Fully compatible with Video Management Software.
27. Weathertight for indoor or outdoor use.
28. All metal vandal resistant housing.

2.19 PTZ IP CAMERA

A. Manufacturers:
1. Axis
2. Bosch
3. Pelco
4. Samsung
5. Sony
6. Panasonic

B. Minimum Requirements:
1. H.264 compression at 720p on all streams.
2. Multicasting or dual stream to achieve 30fps for live view and simultaneous 15fps for recording.
3. IP66 compliant
4. 1/4" CCD sensor
5. 18x optical zoom lens
6. Wide Dynamic Range
7. Automatic and Manual White Balance
8. Automatic Gain Control (AGC)
9. Backlight compensation
10. Electronic shutter operating in the range 1/60 and 1/100,000 second (NTSC)
11. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
12. Provide the ability to control network traffic by limiting the maximum bandwidth to a selected value.
13. Support Quality of Service (QoS) to be able to prioritize traffic.
14. The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard RJ-45 socket and shall support auto sensing of network speed.
15. Clear transparent vandal resistant cover
16. Optional "smoke" or tinted vandal resistant cover
17. Outdoor applications shall have IP66 and NEMA4 rating
18. Thermostat, integrated heaters and fans inside the enclosure (outdoor version)
19. Be equipped with accurate high-speed pan-tilt functionality with 360° endless pan range.
20. 24VAC – 14W indoor, up to 52W outdoor
21. POE+ IEEE 802.03at for indoor models.
22. Indoor -0°C to +50°C (32°F to +122°F)
23. Outdoor Continuous -40°C to +50°C (-40°F to +122°F)
24. SD Card compatibility.
25. Fully compatible with Video Management Software provider.
26. Weathertight for indoor or outdoor use.
27. All metal vandal resistant housing.

2.20 FIXED MAXIMUM SECURITY CORNER MOUNT CELL IP CAMERA

A. Manufacturers:
1. Bosch NEI-368F02-21W
2. Vicon V15CCM-IR-2IP
3. Or Approved Equal

B. Minimum Requirements:
1. All metal vandal resistant housing.
2. Indoor, Corner Mount Applications
3. All-Steel Construction
4. No Exposed Mounting Hardware
5. Lexan® viewing window
6. Each housing shall have tamper resistant screws, the Contractor shall provide the Owner with a tool to remove the tamper resistant screws allowing them to service the housing themselves.

2.21 SD MEMORY CARD

A. Manufacturers:
1. Kingston
2. Scandisk
3. Sony
4. Or Approved Equal

B. Minimum Requirements:
1. 16GB Class 6
2. Compatible with provided IP cameras

2.22 INTERIOR CORNER MOUNT CCTV CAMERA HOUSING

A. Manufacturers:
1. Videolarm
2. Axis
3. Pelco
4. Or Approved Equal

B. Minimum Requirements:
1. All metal vandal resistant housing.
2. Indoor, Corner Mount Applications
3. All-Steel Construction
4. No Exposed Mounting Hardware
5. Lexan® viewing window
6. Each housing shall have tamper resistant screws.
   a. The Contractor shall provide the Owner with a tool to remove the tamper resistant screws allowing them to service the housing themselves.

2.23 FIELD OF VIEW

A. Field-of-View determination by the SEC Contractor as necessary for fixed camera locations shall be performed at no additional cost to provide the view desired by the Owner. SEC Contractor shall coordinate all final camera views and locations with Owner for final approval.

2.24 CAMERA ALARMS

A. All cameras to alarm upon should the field of view be covered by an inmate.

B. Program PLC to create visual and audible alarm when cameras are covered.

2.25 CAMERA POWER SUPPLIES

A. Provide centralized rack mounted power supplies. Power supplies shall have the following:
1. 120VAC input and 28VAC secondary
2. 10 ampere, 280VA rated output (at 28VAC)

3. Output shall have a maximum voltage fluctuation of +/- 10%
4. 16 outputs with replaceable fuse and surge protection shall individually protect each camera output. Each output shall have LED.
5. Power supply shall maintain camera synchronization.
6. Supplies shall be sized with 10% spare secondary camera outputs.
7. UL Listed 2004.

B. Centralized power supplies shall be as manufactured by AlarmSaf or Altronix.

C. Coordinate with Division 26 that all camera power supplies are fed from the same power phase to avoid interference to camera switching.
1. LAN Switch
2. LAN switches will be provided under Division 28.

D. Cat 6 Patch Cables
1. The copper patch cables provided under this contract shall be four pair, category 6 rated cables. Each cable shall be performance tested for conformance to the TIA/EIA-568-B standards for category 6. These cables will be provided under section 27 00 00.

2.26 SURGE PROTECTION

A. All exterior cameras shall have surge protection on both their video and data terminations to guard against induced transients. The suppressors shall be equal to Transtector CCTV-PTZ or equal by Ditek.

2.27 SPARE PARTS

A. Provide the following spare parts:
1. 1 - PTZ camera module with camera (type C)
2. 1 - Fixed camera module with camera (types A and B)
3. 1 - Fixed camera type D (cell camera)
4. 2 - Video output and one video input card.
5. 1 - 19" flat screen monitor
6. 3 – RAID 5 hot swappable disk drives for video storage servers.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. SEC Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified.

B. Refer to Project Drawings that indicate the equipment location within the building.

C. It is the SEC Contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified.

D. Beginning installation means SEC Contractor accepts existing conditions.

E. Where unacceptable conditions are found, the SEC Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

F. The system will be tested and documented upon completion of the installation as specified.

3.2 COOPERATION

A. The SEC Contractor shall cooperate with other vendors and County personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to Rock County Juvenile Detention Center, provided such decision is reached prior to actual installation.

3.3 WIRING

A. All wiring shall be in conduit in accordance with Section 26 05 00 - General Electrical Provisions, Section 26 05 33 – Conduits and Section 26 05 33.1 - Electrical Boxes.

B. Refer to system wiring notes and riser diagrams on drawings.

C. All coaxial cables used within the VSS shall consist of 100% copper center conductor, and 95% copper braid. Coaxial cables with copper-plated steel center conductors shall be unacceptable.

D. All connectors used on coaxial cables shall be of the crimp-on or soldered type, and shall be properly sized for the cable on which they are installed. Crimp-On connectors shall be applied using the connector manufacturer's recommended crimping tools. Type "F" connectors and barrels shall be acceptable for splices. However, splices in coaxial cables shall be minimized, and shall only occur within labeled junction boxes, which shall be identified on the as-built drawings. Twist-on type connectors shall be unacceptable.

E. All wire, cable, and wiring methods shall comply with applicable portions of NFPA-100 (NEC), 1999 Edition.

3.4 INSTALLATION

A. CAMERAS
   1. All cameras and monitors are to be installed as per the manufacturer requirements.
   2. Verify with Owner the camera descriptions to be displayed on each monitor.
   3. All camera locations shall be reviewed with the Engineer and Owner for the intended view of each camera.
   4. Inspect areas to receive camera to insure suitability of application. Contact Engineer for any conflict that may present itself.
   5. Cameras installed within the ceiling tile or grid shall be provided with appropriate reinforcement, as recommended by the camera manufacturer (for integrated housing/camera/lens units) or by the housing manufacturer (for component systems, where the housing, camera, and lens are separate units). Under no circumstances shall such cameras be suspended from the ceiling tile material alone. Sagging ceiling tiles, caused by the improperly supported weight of such cameras shall be unacceptable.
   6. Cameras indicated to be mounted in the corners of vestibule and sally ports shall be mounted as close as possible to the corner of the room for maximum view of the room.
   7. Electrical connections to exterior cameras shall be made by means of NEMA rated, weatherproof junction boxes and conduit terminations.
   8. Seal-tite flexible conduits, with suitable fittings, shall be utilized where connections will need to be flexible (such as where movable parapet mounts are used for service access).
   9. Where raceways penetrate exterior walls, the point of penetration shall be sealed internally, around the wiring, in order to prevent formation and collection of condensation.

10. Any exposed, outdoor cables shall be of a listed Ultraviolet-Resistant type, which will not deteriorate over time when continually exposed to sunlight and temperature extremes. Such cables, if used, shall terminate to the camera housing and/or raceways via weatherproof gland fittings.

B. MONITOR MOUNTING:
1. Brackets used for ceiling or wall mount of monitors shall be installed within strict conformance with the bracket manufacturer's instructions.

C. EQUIPMENT RACK MOUNTING:
1. Provide freestanding equipment racks in accordance with Section 28 50 50 – Equipment Racks.
2. Equipment shall be arranged in the rack, according to the following considerations:
3. Usage - Equipment (Monitors, Servers and NVRs), which will be manually operated/ adjusted, shall be placed at a height which is convenient to an operator, from a standing position at the rack.
   a. Cooling - Equipment shall be arranged in a manner, which allows proper cooling of the equipment – allow space/vented blank rack plates between the amplifiers and other equipment within the rack.
   b. Center of Gravity – In order to minimize movement / accidental tipping of the rack, heavy equipment, and equipment requiring minimal operator interaction shall be placed in the lower portion of the rack
   c. Appearance - Black-finish equipment mounting screws, which are specifically designed for mounting of equipment into rack cabinets, shall be used wherever they will be visible from the front of the rack.
   d. Plain blank plates shall be furnished, as needed, in order to fill-in all open spaces within the front face of the equipment rack
   e. Vented/perforated blank plates shall be provided, as needed, in order to ensure adequate cooling of the rack-mounted equipment

3.5 ADJUSTMENT

A. All camera views shall be reviewed with the Owner and the Engineer and adjusted as required by contractor to the satisfaction of both.

3.6 SYSTEM PROGRAMMMING

A. The contractor shall do all system setup and programming of all control equipment included, but not limited to the following:
1. Camera titles - Camera titles shall be reviewed and approved by the User. Review each components titling capability with the User prior to the development of the title list. Camera titles shall be consistent throughout the system at all monitor locations.
2. Programming of the virtual matrix switcher. – Review call-up camera arrangements.
3. Programming of the network video recorder. - Review functionality and features with the User. Setup camera record rates and program for motion sensing record with preset and post alarm time duration. Cameras with preset to door alarms shall record at a higher rate when in alarm.
4. All PTZ cameras with preset positions shall be programmed for a default position. These cameras will setup to return to a default position upon a user adjustable time delay of no control activity. Review the default parameter settings and camera positions with the Owner.

3.7 IDENTIFICATION

A. Cables associated with cameras and monitors shall be clearly and permanently labeled with the camera or monitor number, with which they are associated.

3.8 TESTING AND ACCEPTANCE

A. Completely test and adjust all camera locations to ensure complete operation of the system. Test all preset alarm positioning in response to door alarms and intercom calls.

B. The SEC Contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g. backbone, station, etc.) as it is completed.

C. The SEC Contractor shall visually inspect all equipment to insure that they are complete and conform to the requirements defined herein. The SEC Contractor shall provide the Engineer with a written certification that this inspection has been made.

D. The SEC Contractor shall conduct acceptance testing according to a schedule coordinated with the Owner. Representatives of the Owner may be in attendance to witness the test procedures. The SEC Contractor shall provide a minimum of one (1) week advance notice to the Engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.

E. IMPORTANT: Failure to provide the above information shall be grounds for the Owner/Engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.

F. Tests related to connected equipment of others shall only be done with the permission and presence of others involved.

G. Should it be found by the Engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the SEC Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the SEC Contractor's expense.

3.9 DOCUMENTATION

A. Upon completion of the installation, the SEC Contractor shall provide 3 full Documentation Sets to the Engineer for approval. Documentation shall include the items detailed below.
   1. As-built floor plans detailing the location of cameras as well as the name associated with the camera as programmed into the system
   2. The as-built plans shall be incorporated into the VSS to be used as the map for calling up cameras.

B. All documentation, including hard copy and electronic forms shall become the property of Rock County. All passwords, programs, source codes and installation media is the property of Rock County and shall be provided to the County as part of the documentation package.

3.10 CLEANING

A. Clean CCTV system components, including camera-housing windows, lenses, and monitor screens, using methods and materials recommended by manufacturer.

3.11 END USER TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain television equipment.

B. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.

C. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.

D. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."

E. Schedule training with Owner, through Architect, with at least seven days advance notice.

F. Conduct a minimum of six hours training including daily operations as well as periodic tasks required to keep the system functioning at a high level.

3.12 SYSTEM ACCEPTANCE

A. Final acceptance testing of the Work will be conducted by the Engineer and Owner.

B. Prior to any final acceptance testing, the SEC Contractor shall submit two sets of preliminary (draft) Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Engineer to conduct the system final test.

C. Conduct a complete test of the entire Video Surveillance System and provide the Engineer with a written report on the results of that test.

D. Fully complete the checklist prior to the burn-in test of the Video Surveillance System. The checklist shall accompany the written certification to the Engineer that the installed complete Video Surveillance System has been calibrated, tested, and is fully functional as specified herein.

E. Following completion of the initial testing and correction of any noted deficiencies, conduct a five day burn-in test. The intent of the burn-in test shall be to prove the Video Surveillance System by placing it in near real operating conditions. During this period the Video Surveillance System shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.

F. Prior to the final acceptance test, coordinate with the Owner for security related construction clean up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the SEC Contractor’s and it’s subcontractors’ tools, construction equipment, machinery and all surplus materials.

G. Upon written notification from the SEC Contractor that the Video Surveillance System is completely installed, integrated and operational, and the burn-in testing completed, the Owner will conduct a final acceptance test of the entire system.

H. During the course of the final acceptance test by the Owner, the SEC Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will

begin by comparing “as built” conditions of the Video Surveillance System to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Video Surveillance System headend equipment will be evaluated.

I. In order to sufficiently demonstrate the Security Camera System’s functionality, the console operator on duty and his/her superior may be requested to perform certain daily operations inherent to the Security Camera System. These operations may include, but not be limited to the following:
   1. Responding to alarms.
   2. CCTV camera call-up on various monitors.
   3. Manipulation of PTZ cameras.
   4. Retrieval of archived video.
   5. Creating a CD from archived video.

J. As all of these operations depend heavily on the training outlined within the Specification, the SEC Contractor shall have completed all of the required training prior to initiation of the final acceptance test.

K. Following the Video Surveillance System headend equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installation, complete functionality of each individual device, and mounting and backbox requirements compliance.

L. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. A manufacturer’s representative may be present on site to answer any questions that may be beyond the technical capability of the SEC Contractor’s employees, if the SEC Contractor so elects or by specific request of the Engineer or Owner, at no charge to the Engineer or Owner.

M. The Engineer retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner’s/Engineer’s fees and expenses related to the suspended test will be deducted from the SEC Contractor’s retainage. Furthermore, in the event it becomes necessary to suspend the test, the SEC Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the security drawings. The SEC Contractor shall supply the Engineer with a detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs or modifications to the system will be conducted without the permission of the Engineer.

3.13 ON SITE ASSISTANCE

A. Occupancy Adjustments: When requested by Owner within one year of date of Substantial Completion, provide on-site assistance in tuning and adjusting the system to suit actual occupied conditions and to optimize performance. Provide up to two adjustments at Project site for this purpose, without additional cost.

3.14 WARRANTY

A. This SEC Contractor shall guarantee all materials, equipment, etc. for 2 years from date of substantial completion of this work. This guarantee shall include all labor, material and travel time. See Division 01, GENERAL CONDITIONS, and GENERAL REQUIREMENTS - Guarantee Documents for further requirements.

END OF SECTION